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Walter Clay Lowdermilk

SOIL, FOREST, AND WATER CONSERVATION AND RECLAMATION IN CHINA, ISRAEL, AFRICA, AND THE UNITED STATES

In Two Volumes

An Interview Conducted by

Malca Chall

Berkeley
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CONSULTANT ABROAD AND AT HOME

1938-1968

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IX TRAVELS ABROAD WHILE ASSISTANT CHIEF OF THE SOIL CONSERVATION SERVICE

Part I Land Use Survey of Europe and the Middle East, 1938-1939*

[Written questions and answers]

Chall: I assume that you thought it was appropriate for our government to make a survey of land use practices in Europe and the Middle East?

WCL: Yes. I thought it was fitting that the Department of Agriculture should make a survey of the experiences of old countries of Europe, Africa and the Near East in the use of land, as it relates to soil erosion, soil and water conservation and torrential flood control. The Near East has special interest for us because it is the site where an agricultural civilization first began and has developed with varying results through thousands of years.

We now recognized that we must spend hundreds of millions of dollars to save and improve our damaged lands. The Department of Agriculture felt it would be advantageous to make a study of these long-occupied lands. I felt honored to be asked to make this survey.

Planning the Trip and its Objectives

Chall: This must have been an exciting challenge to you?

WCL: Yes, I was very enthusiastic about going, the more I thought

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*For more details of this survey, see Tracing Land Use Across Ancient Boundaries, and other personal memorabilia on deposit in the Bancroft Library.

WCL: about it. But there was much to be done. We had most generous and helpful cooperation from leaders of the Department of Agriculture and from State Agricultural Experiment Stations in the preparations for our survey. Letters were written to all the countries I was to visit. We appreciated also the excellent cooperation of the officials in all countries visited, and we made lasting contacts.

Chall: Who all went with you on this trip?

WCL: I was allowed to choose a fine young man named Cleveland McKnight to go along as my secretary. He was to take care of all appointments, letters, travel notes and to go on all government tours. He had to keep track of the three thousand black and white photographs, the hundreds of colored slides and the 2800 feet of colored movie film that I took.

Of course, we would have to have our own transportation, especially across North Africa and the Near East, so we were allowed mileage and could take our own car at our own expense.

My wife determined that this was the chance of a lifetime for the whole family to go along. We paid our own expenses and took our fourteen year old son and ten year old daughter. Some were shocked that we would take our children out of school for a year and a half, but in reality, they gained so much that both were able to skip a grade when they returned.

My wife proved to be a great help. She kept up my reports of each country as we went along. While my secretary and I went on official side trips, she often remained in the hotel, typing notes and reports, so when we returned, the reports on every country were completed.

Chall: How long were you away from Washington?

WCL: We had intended to be gone more than a year and a half, but the war caught us in the Middle East and we returned after seventeen months.

But during this time, we studied 124 areas of special interest, we were on the road travelling 250 days of this time, and slept in 148 different beds. I held one or more conferences with more than 120 scientists and government officials with whom correspondence was carried on while we were in Europe and the Near East.

Chall: How did you go about making this survey? Did you provide yourself with guide lines?

WCL: Yes. Otherwise a survey of ancient and modern use of land in

WCL: fourteen countries within a year and a half would seem an overwhelming task.

The fate of land through centuries of use and misuse is profoundly affected by two types of controls: (1) economic and (2) natural. Economic forces have varied widely through the centuries, influenced by wars, invasions, oppressions, slavery, growth of population, improvement in transportation and autocratic rule. They have lacked continuity. On the other hand, natural controls are more uniform and continuous. They leave cumulative records of their operations through the ages, deeply inscribed in the land.

The first task in our survey was to read the story as written in the landscape of type areas. By confining our objective to the cumulative evidence in land forms and to evidence of past and present use, we restricted our task to manageable limits. Our interest centered in the condition of land and its effect upon human populations. We know that the stage of human progress affects the fate of land resources.

We consulted with geologists, soil scientists, agriculturalists and other specialists on related questions. We made the fate of the physical resources of the land, under cultivation and other uses through the centuries, our primary object of study.

A survey of such an extensive area in the short time of eighteen months required simple but fundamental methods of field study. With the aid of specialists of other countries, we hunted out fields that had been cultivated for a thousand years or more, as a measure of a permanent agriculture, and sought to explain why this or that field could be farmed for a thousand years.

Also we hunted for reasons why fields formerly cultivated had been wasted or destroyed. For this would be a warning to our farmers and city folks of a similar catastrophe in our new America. This simplified method of field study enabled us to examine large areas in many fields quite rapidly. We wanted to see how the farmers had adjusted cultivation to sloping lands through the centuries, their good and poor practices.

Chall: You made your survey both north and south of the Mediterranean. This covered almost every type of climate, did it not?

WCL: Yes, the Mediterranean makes a good dividing line. North of it, the farmers through the ages worked near the forest and the retreating ice sheet. Farms were won from the forest. Increasing population pressures pushed frontiers of cultivation further up steeper slopes and intensified grazing of mountain grass lands.

But south of the Mediterranean Sea, farmers lived near the

WCL: Steppe and desert beyond. Farm fields were won from open woodland, river valleys and from vast areas of the tall grasses. The frontier of cultivation has undergone advances and retreats toward and away from the desert, due to migrations of peoples through the centuries.

England

Chall: What was your route?

WCL: We began with those lands which had been derived from the forest. We arrived first in England, August 16, 1938, and drove immediately up to Cambridge, where I was a delegate to a conference of the British Association for the Advancement of Science. Before starting on my surveys, we reported to the United States Embassy and delivered our letters of introductions and received instructions. Of course, I had to take my family to see Oxford where I had spent three fruitful years as a Rhodes Scholar.

On August 25, we motored to Harpenden, and spent three days in conferences with Dr. E. W. Russell and had a field trip to the famous Agricultural Experiment Station of Rothamsted, the oldest in the world. Then we drove to Edinburgh and visited Boghall Experimental Farm and to Crieff where we attended a Soil Science meeting. We examined Drummond Hill near Edinburgh with its plantation of forest trees and exposed soil profiles.

We found land and water problems in England very different from those in the United States. They had practically no erosion, for the rainfall is misty and seldom comes in a downpour. Farm fields were small and surrounded by hedges or walls, which would slow down or stop the movement of storm runoff, if there was any. Nowhere else had I seen a more vast or complete network of ancient field boundaries, unchanged throughout centuries of land use. It is still a dominant feature of England's twentieth century landscape.

I was deeply impressed with rural England. It was an intimate landscape. It was not wild and untamed like much of the countryside in the United States. It showed loving care by the hands of men and was mellowed with time. It was a contented scene.

Long ago, England established a permanent agriculture. The law of primogeniture, whereby the estate in land passes from

WCL: generation to generation through the oldest son, gave a permanency to agriculture which we of the United States have scarcely begun to know. The first-born of each generation was the trustee of the land. He was the link between his forefathers and his descendents, so he felt a responsibility to make everything last--barns of fine masonry, the manor house, boundaries, all of which were built to last for centuries.

Nowhere did I see such a thing as the unromantic barbed wire fence which is hastily strung around farms in parts of the United States. Some of these field boundaries dated back to Roman times, though of course ownership had changed many times. Some boundaries were made of mossy brick or stone plumed with ferns.

In the north we saw flint stones made into miniature "walls of China," scrambling thousands of miles over hill and dale, representing generations of labor during many centuries. In southern and central England, there were hedges of beech, hawthorn, English holly and hazel bush intertwined with bramble or ivy. Hedges were neatly trimmed, giving the countryside a well-groomed appearance.

Fields were still fertile. Strife over field boundaries must have come to an end long ago, for the size and shapes of fields had endured century after century as marked by unmistakable borders. This was an achievement of far-reaching importance and significance to a soil conservationist.

Chall: The English apparently have great love for their land.

WCL: Yes, they certainly do. Farm lands are limited. England grows only fifty percent of her food requirements; the remainder has to be imported by selling exports. The people are in a bad way if, as a result of war or any other cause, this food supply should be cut off. I know that during the last war, if a farmer did not use his land advantageously, an Agricultural Board would deny him the right to farm it and would assign it to someone else for maximum production!

In the westward march across our new continent, there were always new lands to bring under cultivation. We have not yet begun to feel the pressures of scarcity of farm land, but that time will come in the not too distant future.

The English, with experiences of seven hundred years in dealing with flood waters, developed an Act of Parliament that was, and still is, of special interest to conservationists in the United States. The Act authorized the Minister of Agriculture to designate Catchment Areas, and set up Catchment Boards to administer, coordinate and control the use of waters on the main rivers and tributaries.

WCL: The Boards had wide powers. Bylaws required a farmer to stop erosion on his fields if it sent debris into the river. There were strict laws against any kind of pollution. If anyone failed to comply, he paid a fine not exceeding twenty pounds and a further fine of five pounds for every day in which he continued his offense. This brought prompt compliance through actions of the local court. There were fifty-five Catchments when we were in England.

Holland

Chall: How long did you remain in England?

WCL: We were in England a month and then sailed for Holland, one of the most fascinating countries of the entire survey.

Holland had achieved an unprecedented miracle in de-watering the ocean and transforming more than a half million acres of ocean floor into agricultural lands. A change requiring ages of time by geologic processes was accomplished by Dutch engineers in only a few years. Now the farmer plows the land where formerly fishermen plowed the waves.

We slept at Middenmeer peacefully beneath a dike, against which pounded ocean waves which if allowed could have put us all at the bottom of the ocean again.

Land From the Sea

WCL: This magnificent project was an example of the utmost competence in coordinated engineering skill and agricultural direction.

For two hundred years, Dutch engineers dreamed of diking off the North Sea and making a sweet water lake surrounded by agricultural lands gained from the bottom of the sea. Although many said it could not be done, the engineers continued to plan and to work. Then suddenly a catastrophe hastened the work, just as dust storms in the United States hastened the passage of the Soil Conservation Act.

A furious storm broke some dikes of the Zuider Zee and flooded 32,000 acres, at the very time that there was a shortage

WCL: of imported food due to the war. The clever Dutch had solved construction problems before work was begun. During several years they had taken 34,000 samples of the ocean floor, and knew just what portion would produce wheat, truck crops, pasture and forests. Only on unusable new lands would they create the Yssel Meer or sweet water lake.

These sampling engineers found on the ocean floor just outside the proposed dam in the North Sea, great quantities of heavy, sticky impermeable material of glacial origin called boulder clay. Not far distant was an abundance of fine sand. These two areas were attacked with a fleet of twenty-seven large dredgers, thirteen floating cranes and belt conveyors, 132 barges and eighty-eight tugs. The North Sea was forced to disgorge some twenty million cubic yards of boulder clay and 35,000,000 cubic yards of sand.

First an artificial island was built up into the open sea, half way in the proposed twenty-six mile dike. Work proceeded in both directions simultaneously from this island and from the mainland. A mass of boulder clay was piled up, and behind it sand from the floor of the sea was piled up, to give width to the dike and support to the clay facing.

The inner side of the dam was faced with boulder clay, and finally both sides were covered with basalt rock, to provide adequate protection against storm tides.

The critical time came when the gap was narrowed and the tidal see-saw of waters dug a channel ninety feet deep. But the engineers had left nothing to chance in closing the last three openings of nine thousand feet. They assembled a veritable armada of ships containing materials for the finish. Loaded barges were also thrown in, and the last opening was successfully closed on May 28, 1932, a whole year ahead of schedule. The Dutch had won their one thousand year battle with the North Sea.

Next, polders were diked off; the ocean water was pumped out and gates opened to allow it to flow out to sea in low tides. When dry, two or three years of rains were allowed to de-salt the soils sufficiently for a first planting of legumes which were to be plowed under.

According to the character of soils sampled from the ocean floor, farms were marked off with mathematical precision in sizes of fifty to 160 acres, according to land use. No fences or boundaries were necessary because drainage ditches or moats separated each farm on the long sides. Barge canals bound each farm on the narrow rear end and connected with transportation canals to the ocean or the lake.

WCL: All the scooped-up material had been used to make elevated roads, with hidden electric and telephone wires. Thus each farm had access to both auto and barge transportation. Also, small wells were drilled into the peat and sealed, to accumulate marsh gas which was piped into kitchens for cooking purposes.

Architects, carpenters and masons out-did themselves to build large, ultra-modern barns--architecturally a part of the house--of materials designed to last for centuries. Entire model towns were built to service the rural areas.

The four sections of this Dutch "agricultural heaven on earth" were expected to provide thousands of completely modern farms, sufficient to support at least 300,000 persons both on farms and in business and service activities in the towns. All this was to take place thirteen to sixteen or more feet below the level of the North Sea!

Entrance to this "agricultural heaven" was closely guarded. An average of one in thirty seeking admittance was able to meet the strict entrance requirements. A land manager, or an earthly Saint Peter, passed on all applicants, whether from farmers, doctors, veterinarians, or others who planned to serve the farmers. This manager was most gracious in showing us everything and answering our questions.

Past records, he explained to us, must prove whether farmers are worthy of this stewardship of the land. They had to be of good character and reputable family background, and have sufficient capital to buy machinery and equipment to tide them over a possible crop failure.

Money, if needed, had to be borrowed from a relative and not from a bank. Rent of $12 per acre, increasing to $21.60 as production increased, was paid to the government. When rentals in towns and on farms had repaid the government for this project, then it would be possible to own the land.

All farmers were on probation for six years. Technical advice was free. If at the end of that time, the farmer was found wanting in his stewardship of the land, he was dismissed and his opportunity was given to someone more worthy.

We travelled over and marveled at this great new dike, which provided a forty-foot-wide automobile freeway and had room also for a double-track railway and special paths for cyclists and pedestrians.

Holland has two kinds of land: land above high tide level and land below. A quarter of her lands lie below sea level. The Dutch are indeed a great people, who can hold back the tides,

WCL: filch agricultural lands from the bottom of the ocean, and keep their rivers, laden with silt and floods from two other countries, confined safely within dikes and flowing above the level of their agricultural lands.

When erosion from other countries filled the canals with sand and endangered the dikes, these sands were turned into an asset and used commercially for extensive building programs. They expertly used locks to keep canals level and thereby avoided floods, regardless of occasional excessive rainfall.

Bicycles

WCL: Where else have a people been given so little and done so much with it. Travel was fascinating. Whether Holland was made for the bicycle or the bicycle was made for Hollanders is not known. But they had found each other and lived happily together. Policemen were not needed for auto or pedestrian traffic control but for bicycle control. Everything was carried on bicycles, from huge cans of milk to furniture, and children in baskets peddled along by mothers.

We were fascinated by the morning and evening traffic. Hundreds of bicycles stopped on signal. When the policeman gave a signal, everyone jumped aboard and went off in groups, swarms, droves, clusters--it was difficult for us to find the best collective adjective to describe that unique forward movement down the street.

We were also greatly impressed by how the Dutch take an artistic pride in the excellence of everything produced by the native soil. They conquer the world with tulip bulbs and orbs of cheese. Their Holstein cattle are the finest that breeding can make them. Their agricultural lands and forests are models in management, and the Dutch engineers are the world experts in the use of land and control of waters. The entire country appeared to us to be a well-regulated, prosperous and happy household, whose people were content to stay at home, taking honest pride in their achievements.

Truly, Holland has been an example and inspiration to all nations for the development and conservation of potential materials and human resources. Holland sets an example of conquering nature instead of neighbors, to grow foodstuffs for her increasing people.

Lowdermilk Children Analyzed Holland

WCL: My wife insists that I tell you the definition of Holland which the children worked out in the car as we travelled around Holland. Of course the figures would be different now, but perhaps the ratios would be the same.

"Holland is a fascinatingly colorful country, composed of eight and a half million acres of land, water and dikes, located above and below the level of the North Sea, and inhabited by eight million people [1938], living in spotlessly clean houses, who ride three million bicycles and milk two and a half million black and white cows and export millions of cheeses and tulip bulbs."

After seeing most of Holland's black and white cows, we went to the cheese market at Alkmaar, to see the final story of their products in cheeses that would reach the tables of peoples around the world.

It was with regret that we had to leave the beauties of Holland, the abundance of good food, the inspiration of their achievements in engineering and agriculture, and their gracious hospitality.

Belgium Prepares for War

Chall: Where did you go next?

WCL: Actually we only drove through Belgium and did not attempt to make a survey of the agriculture, because problems were similar to those I would find in France. Yet our experience in Belgium we shall never forget. We were there for a full dress rehearsal for the beginning of another great war. If the curtain had risen on another war, as everyone expected would occur in a few days or even hours, we would have had a close-up view of it.

This rehearsal in Belgium was no small act. One hundred and fifty thousand troops had already been sent to the border and reserves were being assembled by the tens of thousands. The roads were so clogged with movements of troops, tanks, army trucks, cavalry and the assembling of horses being drafted into use, that we could scarcely move. Cars and trucks were commandeered to move troops. We escaped because of our diplomatic license and passport.

WCL: Our first night in Brussels forced the reality upon us. We were awakened by a loud commotion in our hotel. The cook had been suddenly called into army service. The women of his family, loudly weeping, expressed the sorrow and ache of countless hearts in all the mobilizing nations.

Hitler led Europe to the brink of war! Remembering the carnage of the first world war from which they had not yet recovered, they recoiled, gave Hitler what he wanted, and war was temporarily averted.

France

Chall: What did you do in France?

WCL: We spent three weeks just in Paris before I began my survey. The United States Embassy gave me a fine big office overlooking the Place de la Concord, so that I could more easily make my contacts with agricultural officials and plan my survey throughout the country.

We lived directly across from the Parliament buildings and only a few doors from the home of Premier Daladier. We mingled with the tremendous cheering crowds when he returned from Munich, after he and Chamberlain said that they had brought back "peace with honor." But when we read the Munich agreement, we felt that they had brought back honor in pieces.

People were stunned, but it was too late to do anything. Hitler was already marching into brave little Czechoslovakia--handed to Hitler on a silver platter. She was prepared to fight and might have held off German armies until others could have come to her rescue, but she never had a chance. This appeasement only postponed war and gave more power to Hitler, whetting his appetite for aggression.

Reclaiming Land From Sand Dunes

Chall: What was your first special study?

WCL: I had heard that France's reclamation and transformation of a vast, desolate "moist Sahara" of invading sand dunes, covering

simply studded with interesting museums, collections of all kinds, historic places, parks, avenues lined with ancient trees, gardens, etc. We spent three weeks in Paris at the time of the "Crisis" and enjoyed every minute of it. Walter was so busy that we scarcely saw him so we saw the sights, but he did take us to the opera one night. The famous LOUVRE, near our hotel, is the grandest accumulation of Art Treasures to be found in the world. Here is the original "Venus de Milo" (by the way, did you know that she is made in two pieces and can be taken apart when moved) and the glorious "Winged Victory" and miles and miles of galleries. We went there four times and felt we had not begun to see it. We climbed to the top towers of Notre Dame and later stood spellbound before the glorious stained glass windows and listened breathlessly with delight at the deep tones of the great pipe organ vibrating through the cathedral. We rose by elevator to the top of the 1,000 foot Eiffel Tower, and there waved around in a strong wind until I had a seasick sensation. I felt a bit panicky.

I have not time to begin to tell you all about what we did and saw in Paris. We mingled with a crowd of one hundred thousand others at Napoleon's "Arch of Triumph" when Daladier returned from Munich with "Peace with Honor" or rather "Honor in Pieces" and stirred the flame on the Tomb of the Unknown Soldier. We lived only a few doors from the home of Premier Daladier and saw him several times. We saw the unveiling of a statue of the former Belgian King, in the presence of the King and Queen of Belgium and a princess or two, and more accumulated people than I have ever seen in my life.

From "Notes and Impressions of France." One of a series of "Notes and Impressions" written by Mrs. Lowdermilk to relatives during the tour of Europe and the Middle East.

WCL: two and a half million acres, was a classic in land conservation. I wanted to see it. This southwestern region of France, called Les Landes, was once the sore spot of the nation. Where there had been poverty, malnutrition, disease and despair, now there were beautiful forests, pleasure and health resorts, and flourishing populations who had assurance of prosperity and culture for the future. The vast annual revenues from the production of timber and resin alone made this one of the rich areas of France. Financially, the work had paid for itself many times over.

Chall: What were these sand dunes and how were they controlled?

WCL: Two major problems demanded solution. First, the planting and fixation of 400,000 acres of sand dunes on the move, an ominous white sea of ever-shifting and rolling sand along the coast; and second, the draining and afforesting of Les Landes, the pestilential flat marsh lands which extended far into the interior of southwestern France.

From Bordeaux on the coast of Gascony to the rocks of Biarritz, the area was being invaded about forty-five feet a year by wave after wave of mountainous, bleak, white, ever-rolling sand dunes. Often they reached heights of 175 to 300 feet, were from three to five miles wide and 150 miles long.

These acted as dikes which dammed up the natural outlets of streams and rivers to the ocean. This caused accumulated waters to form unhealthy malaria-infested marshes which extended further and further into interior plains. A total of two and a quarter million acres had to be reclaimed.

Chall: How long had this been going on?

WCL: We know that in the time of the Gauls, about 600 B.C., aborigines had extracted pitch from resin-producing maritime forests here, and had carried on active commerce with the Romans. Then in 406 A.D., the destructive Vandals invaded the region and as usual, destroyed everything in their paths. Only two small forests remained.

Sand dunes began to spread and advance inland. These dunes, formed in modern times, covered more than 400,000 acres. As they moved inland, they engulfed farms and homes and towns. One dune covered a large church and was called "The dune of the church." Devastation increased until the two and a quarter million acres were considered almost without value.

Successful drainage of this vast area was due to the vision and perseverance of an engineer, Chamberlent. Centuries of feeble but unsuccessful attempts at reclamation had been tried. So Chamberlent purchased twelve hundred acres in the most sterile

WCL: area which offered the greatest difficulty in drainage. He dug infiltration wells and then sowed seed of maritime pine and oak. The results were outstanding and in six years, trees were twelve feet tall. This proved the success of his method, and in 1857 the State passed an act which ordered the drainage of all lands in the Gironde and Les Landes provinces affecting 750,000 acres.

It was just at this time that the Civil War broke out in the United States. No longer could the United States export resinous products to Europe. A barrel of gum formerly selling for thirty francs increased in value to three hundred francs, so this area rapidly became rich from resin and from timber products. Today, it is one of the richest rural areas of all France.

It required seventy-eight years of intermittent work to transform these acres of sterile dunes and malarial swamps into this rich prosperous region. For comparison, the French left one sand dune near d' Arcachon, which is two miles long, half a mile wide and three hundred feet high. Here one can stand and look inland across a billowy sea of green forests and marvel that once all those 400,000 acres were like this restless giant dune underfoot, which moves inland about sixty-five feet a year.

Chall: Did you write a report on just how this work of draining and fixing sand dunes was carried out?

WCL: Yes, I did, and it was published shortly after I returned to the States. There is considerable detail on the various steps taken, which I will not repeat here. But I want to say that money from the sale of some of the reclaimed communal lands provided money for building town halls, churches, roads and the like.

Thus a country which was poorest of all France went through a complete transformation as a result of its drainage and afforestation work here. It brought economic prosperity and health to the region. The cost of the work was small in comparison to its gains.

Fish Ponds

Chall: I understand that you made a special study of the rotation of fish ponds and fields in France. Why was this important?

WCL: I recognized at once that fish ponds were something that would be advantageous to our farmers in the United States, and which up to then we had not tried. When I returned, I wrote it up, talked it up to farmers; and before long, this plan of fish ponds had spread all around the United States through our Soil

WCL: Conservation Service.

Chall: Just how was this done?

WCL: This unique method of land use I studied in the region of Les Dombes, in the province of Ain, lying between the Saône and Rhône Rivers above their junction north of Lyon. In this region, ponds were strung like beads on the drainage channels of shallow valleys.

Here were approximately 250,000 acres of which about forty thousand or more were in fish ponds. The soil is of heavy clay of low permeability and well suited for holding water. Average rainfall is about thirty inches and well distributed.

Low dams of tamped earth, fitted with gates and spillways, were made into elevated roads beside ponds. These varied from thirty to six hundred acres, but the usual size was about fifty to a hundred acres. Water discharged from one pond flows down into others on the gentle gradient called for.

Higher land above pond levels devoted chiefly to permanent pastures for production of livestock yielded runoff from rainfall to fill and replenish ponds. Catchment areas could not be less than six times the pond area which they supplied. Farmers made use of the same water as it progressively passed down from field to field.

The usual rotations for Les Dombes region were two or two and a half years in water and one or even one-half year in grain.

A number of species of fish were grown in these ponds of which carp (sixty percent of the total), tench, pike and whitefish were the most important. Sometimes other fish got into the ponds by accident: eels were welcomed, but the catfish were so destructive that farmers went to great effort to eliminate them. The French had developed a new strain of carp without scales and it weighed two and a half times more than the scaley variety.

Nursery ponds were stocked with mother fish, especially guarded and protected. The ratio of male to female was five to two. Each mother deposited around 200,000 eggs. Ponds were stocked with about one thousand, six-month-old carp per hectare; when two and one-half years old, they weighed four and one-half pounds each and were ready for harvest. The average harvest was about 440 pounds of fish per hectare (176 pounds per acre).

Fish were harvested in the spring, in time to sow a crop of summer grain in the pond basin. On harvest day, the fish merchant was helped by a couple of neighbors. The pond gate was opened, water was reduced to a small area; then the fish were seined out

WCL: and placed in a trough full of water in which various species and sizes were separated, some of the larger going to market, some of the smaller put into other ponds to continue growth.

It only required ten men six hours of work to harvest fish from a large ninety-acre pond. The yield from the water crop of the rotation is greater than that from the grain crop. The grain crop is desirable for providing conditions for fish food; in turn, the fish fertilize the grain crop.

As soon as the fish pond had dried out, it was plowed and sowed to grains, generally oats. This rotation of wet and dry fields--fish and grain--represented the highest type of land use for this area. Furthermore, fish culture required less labor than ordinary agricultural crops. For example, a farmer and his son, or one helper, were able to do all necessary work on nearly three hundred acres, except on the day of harvest.

It may be surprising to find that the annual yield in weight of fish from an acre of water surface equaled or exceeded the production in weight of beef for an equal area of pasture. It was produced with less labor and with less expense in fertilization and farm equipment, and the net income exceeded that which could be earned from raising stock for beef production.

So you see why I was enthusiastic and wanted to start this type of fish and grain rotation here in the United States in areas where this unique type of land use could be developed.

Chall: As one crosses the United States by plane, one sees many farm ponds shimmering in the sunlight. Are these an outcome of your report from France on fish ponds?

WCL: Perhaps in part. But even when the physical conditions were not right to carry out the rotation, it proved so desirable to have a farm pond--for stock watering and for stocking with fish for the family food--that they were put in by the tens of thousands. Where these ponds could be made large enough, some were turned into recreation areas, and public fishing, for a price, has been remunerative to the farmer.

Strip Cropping by Inheritance

Chall: What other land use practices in France interested you?

WCL: I was greatly intrigued with the unusual and extensive strip cropping, and at first thought that it had been put in as erosion control measures, for agriculture has existed here since

WCL: Roman times. But soon I noticed that, as often as not, the strips ran up and down slopes, as well as across slopes, so there had to be another explanation. The Director of Waters and Rural Engineering explained to me that this phenomenon was not a purposeful or planned program of farmers; but was the outcome of repeated divisions under the laws of inheritance, and had become a serious burden on an efficient agriculture in France.

During feudal times, large tracts of land were held by lords, dukes and landed gentry. After the revolution, their properties were divided equally between heirs who in turn divided it into smaller parcels to their multiplying offspring. After more than a century of this practice, results were startling.

Division into strips was always along a service road. Some fields had been fragmented until strips were only a few feet wide, some running hundreds of feet away at right angles from the service road. If the road ran up and down the slope, then strips were on the contour and, either by hand labor or by plowing, had been benched as an effective means of erosion control.

But if the service road ran across the slope, then the up and down strips caused serious erosion. This soil was so precious to the farmer that annually, at the end of the rainy season, he shoveled by hand the earth washed down from his field, loaded it in a cart and hauled it to the top of his field.

This "strip cropping by inheritance" is a terrible burden on the French farmer. I have numerous maps showing the subdivisions. One is a commune of 214 acres that was divided into 815 separate parcels of land, owned and operated by 115 different farmers. Another commune was on 380 cultivated acres, divided into 1,349 strip parcels. In another commune, forty-seven owners farmed 750 parcels on 505 acres.

So serious was the problem of this minutely divided or fragmented land that an Act of May 4, 1919 placed the services of the Director of Waters and Engineering at the disposal of farmers who would form syndicates for the consolidation of their holdings, for adjustment of boundaries, and for the relocation and building of additional serving roads.

While much had been done by 1938, the problem was far from solved. As an example, in an area of 121,720 acres, 179,819 separate parcels with 8,619 owners had been reduced by consolidation to 38,136 holdings. To accomplish this, more than five hundred miles of new service roads had been built. This was only a beginning of what had to be done if farm holdings were to be large enough for profitable modern methods of production, and large enough to apply contour erosion control measures on the highly erodable sloping lands.

Farming on Ancient Phoenician Terraces

Chall: I hope you saw other and better land use methods in France than these you just described.

WCL: Indeed we did. One of the most delightful periods of the studies in France was a two-week stay at Auberge D' Colombe D'or, a picturesque and unique country hotel whose guest book contained names of many royal visitors, many of the elite of Europe, and many visitors from the United States. This ancient hostel was recommended to me by a member of Secretary Wallace's staff.

The owner of this Pension was an artist of means who pitied the starving artists during the depression, and invited any and all to come there and live without expense. The only stipulation was that each should paint one picture a month, of any size or theme, to give to the Inn.

The paintings were retained until after the death of the artist; some of them, of course, eventually became very valuable. When we were there, the walls of all rooms were covered with original paintings. M. Paul Roux, the Aubergist, did not lost money by this venture.

This picturesque inn or hotel was located on the slope of a hill that was crowned with an ancient, fortress-like stone wall behind which was a densely populated village. Each night, somehow, the entire village tucked itself away to sleep, but in the day, all men and many women went to the fields to work.

This place was of special interest, for all the hills around had been covered with stone terraces that we estimated were built some three thousand years ago by the ancient Phoenicians who had colonized here. The terrace walls had been carefully maintained through the centuries. In our vicinity, terraces grew vineyards and some orchards.

But nearby, at Grasse, hundreds of acres of terraces were entirely devoted to growing flowers, mostly roses, for the famous French perfumes. It was the most fragrant use of land I have ever experienced.

When the land "gets tired," usually about every seven years, these flower farmers, by hand labor, turn the earth entirely upside down: they bury the topsoil about four feet down to let it rest and bring the former bottom soil to the surface for another period of cultivation.

Exploring Caves

Chall: What were some of your other findings in France?

WCL: I would like to mention one that interested me especially. One hears much of alpine climbers and skiers, but France had developed a new skill which was in the interest of conservation and discovery of water supplies. Instead of climbing outside the mountains, they climbed inside them, and developed technique and equipment which had resulted in much "inside information."

Two things are necessary: the first is nerve; the second, and more important to the alpinist, is equipment developed for subterranean climbing. This consisted of a lamp and powerful flashlight and about forty pounds of equipment carried in back packs--axes, spikes, extension rope or wire ladders, rubber boats for subterranean lakes, bits of red papers to be used as markers, condensed food for emergency delays.

Scaling crags and glaciers under sunlit skies is play compared to scaling underground cliffs and climbing down into apparently bottomless pits and labyrinths of limestone caves. These are uncharted caverns of an underworld where the forces of nature have held sway for millennia, unmolested by man.

Because of the difficult and tedious journeys down to and up from some deep caverns, the explorers remained inside until the exploration was sufficiently completed, sometimes for twenty-four hours at a stretch. With cameras and flashlights, they could capture the hidden secrets of these earthly depths and bring them to the surface for further study.

There were numerous instances of the material value of these explorations. These climbers had investigated a cavern high on a cliff, below which a large stream gushed forth on the valley floor. Winding, climbing, sometimes crawling back into this cavern, they found a large pit into which a stream on the opposite side was tumbling. One of the climbers descended over the brink through the tumbling waters, attached by ropes to the equipment and crew above. He saw the relationship between the stream and the spring.

With little time and expense, the villagers utilized this find to produce electricity for the valley. So these daring young men had discovered these hidden water resources which could be used beneficially by numbers of villages in this farm valley.

We were invited to explore some of these caves in order to see the technique and equipment used in making these water conservation investigations. But we were not interested in sliding over waterfalls into black depths below, or intrigued by diving

WCL: through siphons of icy waters to more remote chambers, and were willing to accept the "inside" information accumulated by these experienced and daring explorers, without substantiating for ourselves the truth of their statements.

Torrents and Mud Flows

Chall: Which one of your investigations in France do you feel has had the most long-range value for us here in the United States?

WCL: I believe it was my survey of torrent control measures in France, Italy and Switzerland, in the mountain massif in central Europe. We may well profit by the experience and information which had been gained in these costly experiments and achievements, particularly in France and northern Italy.

Our nation is committed to spending hundreds of millions of dollars for flood control; the problem is becoming rapidly more urgent and important in mountainous areas. Failures are no less instructive for us than successes. On the whole, the outstanding accomplishments in Europe have suggested similar works for the mountainous areas in the United States.

For seventy-five years, a battle with torrential floods in the densely populated mountainous regions of eastern France, and later in Italy, had been an inspiring contest with natural forces. As population pressure pushed clearing, cultivation, and heavy grazing onto these steep mountains, torrents of the ice age were rejuvenated or created anew.

They spread havoc in the narrow valleys, overwhelming villages, farm fields and meadows, cutting highway, railway, and phone lines, filling streams with erosional debris, and damming streams with mud flows. As flood waters were impounded behind temporary mud-flow dams, they rose until they broke through to create floods of unprecedented velocity and destructive power.

We in the United States are beginning to experience the wild waters and mud flows which Europe has known for the past five hundred years or more. The enormous cost of works to avoid the damages of floods, like those in Utah in 1930, the Ohio Valley in 1937 and 1938, and California several times since 1964, justify a careful study of European experiences with torrential floods and of their tested methods of control.

Chall: You have always been interested in watershed studies and I can imagine you were enthusiastic to see what France and Italy had accomplished.

WCL: It was the realization of a long hoped for experience for me to see at first hand the works of erosion, torrent and flood control in these mountains of France and Italy. It was an inspiration to inspect the works of torrent correction which Surrell, Demontzey, and Mougin had the capacity, courage and faith to begin and to carry through to signal achievements.

The correction of mountain torrents is a gigantic chess game between man and the forces of nature. It is man against nature, a situation in which man may perchance delay the inevitable long enough for his purpose. It takes time to play this game, and money too, and it takes daring as well, and minute study and observation of natural forces at work, and of every move in response to works of correction, in order to checkmate the forces of destruction.

In the past, torrent control work had been more of an art than a science. It had been based on trial and error methods with close observation of results. So a great mass of empirical information had been built up in the minds of field staffs, though not often fully written.

For us to learn these methods, we had to inspect these torrents and the works of correction, and discuss in detail with officials in charge, the methods and means employed and reasons for their adoption for different sets of conditions.

The history of torrents is related to progressive human occupation and intensive use of mountain valleys and slopes. Blanchard, in Les Alpes Francaises, states that evidence indicates that the French Alps were as densely populated in Roman times as now. Also the French Alps, rich in metals, were the scene of much mining activity during the iron age. This mountain massif of Central Europe that lies within the boundaries of several nations and has so long been inhabited by man, has produced torrential flows that from time to time have created havoc and great loss of life and property.

French and Italian officials were most generous to me in sharing their experiences, and information, and time conducting me to places of special interest, too numerous to mention here. I was especially interested in the Torrent of St. Julien that was taxing the experience and ingenuity of the French engineers. It was a great laboratory in a basin of more than five thousand acres, where critical conditions of many phases of torrent control could be studied.

In the Italian Alps, I also studied torrent control on the Euza, a torrential tributary of the Po River. Later I noted torrents in the mountains of Algeria and Palestine, and in the Lebanon Mountains. All appeared to be increasing in intensity, rather

WCL: than decreasing in intensity.

Some have suggested a change of climate was responsible for these torrents. Yet my experimental studies in northwest China and in the United States showed that changed surface conditions of the land may bring about less intake of rain by soils on slopes and increase the coefficients of runoff. This induces gullying of slopes, and thus the effects of an adverse change of climate may be produced in semi-arid regions without any actual climatic change.

The history of these mountainous areas is one of dense populations that were cut off from the outside world until construction of auto roads and were dependent on these steep slopes for food, clothing and shelter. The forested slopes were cleared and cultivated; the grassy lands were heavily grazed by flocks. The baring of slopes formerly protected by natural forests brought on greater runoff and accelerated erosion.

This has proved to be the case, whether in the United States, a new country, or in old lands in northwest China and the Near East. A recognition of man's part in the acceleration of storm runoff, of torrential floods, and erosion of soils, calls for study and measures of conservation of soils and waters, to maintain the productivity of a land in support of its population.

There is need today for study of water moving at high velocities, in large volumes that are capable of doing an enormous amount of work in scouring and transporting material. In former alluvial fills, torrential streams cut and load up with material to capacity. Then a strange phenomenon occurs. I found it in southern California, in Utah, as well as in the French and Italian Alps.

Under the pull of gravity on steep gradients, the overloaded stream is changed over into a mud flow, the most destructive and unmanageable type of torrent, and picturesquely described by French writers as a "lava flow." Sand will not produce a mud flow, but sand combined with a clay fraction will.

The hydraulics of clear water is understood, but that of mud flows is not yet. It is a plastic mass in movement wherein the water content may fall as low as twelve percent of its total volume. The specific gravity of mud flows rises to that of a concrete mix. A mud flow only three or four feet deep will float out boulders weighing many tons and measuring five to six feet in diameter.

Such flows crash through brick walls of houses, as I saw in California, and they have been observed at times to seem to flow uphill. Study of mud flows deserves international cooperation and collaboration.

WCL: There is no time here to go into detail as to types of control and structures. But there is justification for these costly works of torrent correction even though they exceed the value of eroding lands many times, even to a hundred-fold. Justification is found in the protection of lower-lying farm lands, of communications, and of life. This I also found in Japan where they immediately spend whatever is necessary to repair any landslide or bared spot on their mountain slopes that might produce a torrent or a mud flow.

If the use of land under private initiative or by cooperation of public or private effort, or by public effort alone, cannot justify the expense of control, then such lands need to be withdrawn from destructive use and put to a less intensive but safe use, in the public interest.

Justification for works of torrent control in France and Italy can be found in maintaining the habitability and productivity of these picturesque and productive mountain areas. Many phases of the use of land and waters are involved, such as unstable conditions for a sturdy mountain folk.

Water power, for example, is an important resource of mountains in humid climates as in France and Italy and also California. The full utilization of such power, the safety of dependent industries, and the regularity of water supply, the safe-guarding of recreational facilities, and sustained productivity of valley lands, are considered ample justification for these comparatively costly undertakings.

Europe recognized the need for torrent control more than a hundred years ago, and has developed this technology to high technical proficiency. For this reason, their experience is of great interest to us in the United States where torrential flood damage is a menace to human life and property values, and is increasing flood by flood.

Chall: I can see it was an advantage to combine the studies of torrent control in French and Italian Alps, for the problems seem the same.

WCL: We found very much of interest to us in land use problems and reclamation works in France, but we left France with a certain depression. For it still bore the scars of war: in the landscapes, in the acres and acres of crosses over the silent dead, in the bombed buildings and among the people. It was sad to see the countless old women carrying fuel, pushing heavy carts, watching sheep out in the cold winds, using their gnarled work-worn hands to knit--they were the widows of the million or more Frenchmen who died during war years.

Italy

WCL: France was more run-down than we had anticipated, while Italy was progressive, with a snap and fire that we had not found in other countries of Europe. If we did not know what Mussolini did to Italy by joining forces with Hitler, we might believe that he was the best thing that had happened to Italy in fifteen hundred years.

Public works were progressing at an astonishing rate. Highways were in good condition and beautifully parked and cared for. There appeared to be no unemployment. People were well dressed. Trains ran on time. People were safe. There was very little crime.

But everywhere were huge pictures of Mussolini and underneath the words, "Obey, Believe, Fight." The state proclaimed itself a wise father in the many lines it worked for the good of the people and the glory of Italy. But it asked one thing in return: prepare to fight.

Everywhere slum clearance was being rushed. Before old buildings were torn down, permanent concrete suburban cottages and apartments were prepared. Italy was everywhere excavating her past, and repairing or "face-lifting" ancient statues and glorious public buildings. Special emphasis was placed on large families, and bachelors, after a minimum salary, got no increase until married. A bonus was given for each additional child.

Government officials were most cooperative in showing me all their works of reclamation and conservation, both of natural and of human resources. The only unpleasant feature was that the proverbial sunny skies covered themselves with a wet blanket which rained or snowed on us almost every day from the Italian Alps in the north to the toe of Italy in the south. But we saw erosion in action and how the Italian farmers dealt with very difficult problems on their steep sloping lands.

When young, I thought of Italy in terms of Vesuvius, Pompeii, the Leaning Tower of Pisa, and Rome, the museum of the centuries. On this trip, these became realities, but Italy was much more than these places. We staggered up the Leaning Tower of Pisa, climbed Vesuvius on Christmas Day, just after she had disgorged two hundred acres of red hot lava, and visited Pompeii, the city she had buried in fury in 79 A.D.

It was weird to walk down silent streets, haunted by evidences of human life, dead for almost two thousand years. Here 22,000 Roman citizens, besides slaves, lived in opulence that

WCL: boasted marble theaters and amphitheaters, gorgeous public baths, temples, forums, luxurious homes resplendent with carved statues, carvings and paintings, intact today because they had been buried from the vandalism of man.

Hillside Agriculture

WCL: We entered Italy from France onto the Italian Riviera, which surpasses the French Riviera, and for two days traveled this rugged shore over which Roman legions somehow blasted a trail to enter Gaul and Spain. Even the steepest hills were terraced and cultivated to the very tops with grapes or olives. These latter appear as forests and their grotesquely gnarled trunks, with roots protruding several feet above the former level of the land, betray an age almost geologic.

For centuries it was considered a capital offense to destroy an olive tree. Among these steep mountains are picturesque villages, perched precariously on cliffs or tucked away in the folds of deep valleys, all of which show centuries of occupation.

Chall: Where were your headquarters for the survey in Italy?

WCL: We traveled to Rome and noted en route great areas being plowed, apparently for the first time in centuries, with the long-horned oxen of Italy. They were large estates that Mussolini had taken from the big land owners and was preparing to divide into small farms for the people. In other fields still in private ownership, subsistence farmers were actually plowing their small fields by the sweat of their brows and the ache of their backs for they were spading it up by hand, lacking plow and animal power.

Italian officials were eager to show us all they had been doing in reclamation work, and I should have had double the three weeks that I spent there.

Since ancient times, the people of Italy have had to snatch the soil from the fury of destructive floods rushing off the precipitous mountains, or from eroding cultivated hillsides by unbelievable labor in terracing, or from marshes infested with malaria.

We believe these terraces date back perhaps three or four thousand years to the Phoenician colonization there. They had first discovered the cause and cure of destructive erosion on their steep mountain slopes in the Lebanon Mountains when they cut the cedars and population pressure required farming of these lands. They built stone terraces to hold back flood waters and

WCL: control erosion.

Wherever they established colonies around the Mediterranean, we find that they took these erosion control measures with them, and the hills of Italy are still productive on these terraced fields.

Most of Greece, on the other hand, was too strong for Phoenician colonization; the hills therefore were not terraced, and erosion of centuries has in many places washed away the soils to bed rock.

On these densely populated lands of Italy, an average of 353 people per cultivated square mile (as against fifty in the United States) must secure food and sustenance from the soil. The only areas available for colonization were the large grazing estates of rich land owners and the barren wastes of marsh lands.

The Mussolini Law of 1928 coordinated all phases of reclamation and initiated a tremendous effort for the complete recovery of all lands of Italy for the sake of a better economic, hygienic and social future for the nation. During the ten years previous to our survey, successful reclamation and colonization of barren and marsh lands had surpassed that accomplished through all preceding centuries.

Chall: That sounds like a tremendous achievement.

Reclaiming the Pontine Marshes

Chall: What did you consider their greatest reclamation works?

WCL: Without doubt, the draining and reclaiming of the Pontine Marshes was their greatest achievement. It is a fascinating story and a very, very old story. It is probable that the rapid rise in population after the founding of Rome in the 8th century, B.C., induced the clearing of vegetation on the steep slopes of Italy, either for cultivation or for grazing herds. The steep gradients, combined with heavy rainfall, permitted rapid erosion of the soils derived from volcanic ash that covered the mountains.

This mass of material filled up drainage channels and silt was carried out to sea where the erosional debris was sorted by the waves and piled up as sand dunes along the shore. These dunes served as dikes to prevent drainage of coastal plains into the sea. Undrained pockets and the fifteen thousand acres slightly below sea level formed marshy swamps so deadly that living on adjoining

WCL: dry lands was almost impossible.

The struggle against these deadly marshes through which runs the famous Appian Way to Rome was attempted by Appius Claudius in the 4th century, B.C. Then from Julius Caesar on, numerous emperors and a number of Popes, particularly Pope Pius the Sixth, attempted the task of drainage without success.

But the Fascist regime of Mussolini succeeded where all others through the centuries had failed. His speech at the inauguration of the entirely new province of Littoria, created from a part of the newly populated Pontine Marshes, is significant of the spirit in which the problem was attacked.

> "Only three years ago, there stretched around us the deadly marshes. We have waged a very hard battle. We had to face nature, material difficulties, and the scepticism and moral cowardice of those who doubted the victory. For us Fascists, the fight itself is more important than the victory, because when a battle is begun with an iron will, it is unfailingly crowned with success."

Drainage procedure was most interesting. All precautions and preparations for a major battle were coordinated in this attack to reclaim the Pontine Marshes and destroy the deadly enemy entrenched there. All machinery and equipment were assembled in the camp outside the battle zone.

Instead of venturing slowly with small groups of workers into the domain of the enemy, thirty thousand men were assembled. The housing quarters for this army had been built in sections with each door and window well screened. When all was in readiness, the command to advance was given. Nightfall found the army of workers well within enemy territory, housed in insect-proof dwellings.

Each building was in charge of an officer to whom all inmates daily reported before work, and in the officer's presence, each swallowed a large portion of quinine allotted him. Work was feverishly rapid, but ceased entirely before sundown so that men were all in barracks, behind screens, before the deadly winged enemy flew out in search of evening meals. There were several varieties; the most vicious caused death within a few hours. With the first symptoms, patients were rushed from the marshes to hospitals behind the lines.

The rapidity of this campaign was amazing. The first work began in November, 1931, with the clearing of about six hundred acres of swamp forests, which were converted into charcoal. Two months later, drainage was sufficiently complete for the construction of reinforced concrete farm houses on this first area. In

WCL: June, work began on the new city of Littoria, and in December, six months later, all public buildings and housing sufficient for eight thousand persons were completed.

Littoria, as well as all the other new towns in these former Pontine Marshes, was a model city of splendid architectural design, with wide streets, parks and ample parking space for future automobiles. The ultra-modern dwellings and apartment houses were built of reinforced concrete, painted on the outside. There was a permanency about all that had been done. The City Hall was magnificent with its marble stairs and Council Chambers, carved furniture, and floors paved with red and black marble.

The misery of the past was recalled by a huge and appealing painting in the reception hall: the father has been stricken in the fields and is dying; the children are weeping, while the mother with uplifted arms looks imploringly heavenward with an unforgettable expression of hopelessness and sorrow; in the background is the small farm house and beyond it, the marsh lands. The poverty and tragedy was a striking contrast to the hygienic, permanent cities and farm houses that sprang so suddenly from these former deadly marshes.

After the completion of this first area that was made into a new province, work was pressed forward; and within two and a half years, the 182,000 acres of the Pontine Marshes had been reclaimed.

Chall: How did Mussolini go about the actual work of draining the marshes?

WCL: Well, one should see it to realize the effort involved. To reclaim the first 104,000 acres, it was necessary to build 1,097 miles of canals, and 260 miles of roads, and move almost six million cubic yards of soil. The huge Mussolini canal and several smaller ones wind around the lower slopes of the precipitous mountains and carry all flood waters directly across the plains to the sea. Waters are collected by fifteen pumping stations run by power from the mountains twenty-five miles away.

There had just been a heavy rain when we visited Mazzocchio, the largest of the stations, that drained twenty thousand acres. Only four of the seven pumps were working, lifting 2,600 gallons per second twelve to fifteen feet to the higher canals which carry waters out to sea. Floating grass mowers are constantly on duty, cutting the water vegetation to keep canals open and prevent infestation by mosquitoes.

For two days, we drove over fine roads in this interesting landscape of concrete, tile-roofed farm houses painted cream, light blue, tan or white, stretching from horizon to horizon. The colors varied each time a section was completed. The houses

WCL: are Mediterranean style--each home contains three bedrooms, a storeroom, and a kitchen which is the family meeting place where we were entertained. An arched porch under one of the bedrooms makes a fine shady workshop.

Each home is provided with a good well about twenty feet deep, and an outside oven for baking bread, and a shed for fifty to sixty chickens and a family pig or two. The average number in these farm families was said to be ten or more--parents, children, a grandparent or more, and sometimes a married son and family. Schools were provided and education was free through primary grades.

While I have gone into detail on the reclamation of the Pontine Marshes, it was typical of the reclamation of smaller marshes which we saw in other parts of Italy.

Breaking Up Large Estates

WCL: During the fourteen years previous to our survey, the Fascist regime, through the medium of corporations, carried out and largely completed work on some 12,767,300 acres. These corporations were for the maintenance and expedition of reclamation work and were composed of representatives of the government, representatives of private land owners in the area being reclaimed, and corporation officials. In Italy, at that time, there were some seventeen hundred corporations that controlled a total of about forty-two and a half million acres.

The most powerful corporation was the National Association of Ex-Service Men, which had the power to purchase tracts of land and where necessary, use compulsion to force private land owners to sell or cooperate with the reclamation scheme. All lands were prepared for intensive agriculture and divided into small holdings for individual farm families.

Chall: You tell of taking the estates from the large land owners and dividing the land into small farms. Did the Fascist regime not believe in private ownership of lands?

WCL: Oh yes, they believed private ownership of land was important for the nation's welfare, but made the transformation of estates for colonization compulsory, and insisted on the cooperation of small land owners in an area to be reclaimed. The private owner could transform his estate for colonization at his own expense if he wished, or he could borrow from the State to prepare his lands for colonization and sell a part of them to repay his costs. But if the large land owner refused, his lands might be

WCL: expropriated.

Private gain or loss was not considered in determining the advisability of the work. The regime believed that production of crops on new lands was best carried out by peasant families who had long been associated with this type of work and would be even more successful when working on their own lands.

Chall: It seems at this time that Mussolini was interested in land reclamation largely for the benefit of the masses and the glory of Italy.

WCL: Yes. Italy was setting her national lands in order for permanent agricultural production and placed many tens of thousands of her people on newly reclaimed lands. The development of such large regions of agricultural lands and new cities to serve them, created demands for so much labor that the unemployed who had been put to work were absorbed into permanent positions.

These works served a three-fold purpose: they provided immediate employment for tens of thousands of unemployed during the depression, provided agricultural lands and homes for overflowing populations, and created an inestimable wealth for the nation as a whole.

The emphasis of my survey in Italy was on the study of their remarkable works in torrent control, their reclamation and resettlement of the Pontine Marshes and smaller drainage of marsh lands, and the reclamation and colonization of the many vast land holdings, formerly grasslands, where peasants were now farming intensively. We left Italy with much admiration for the splendid work in human and land redemption that Fascist Italy was doing at the time we were there.

Sicily

Chall: On leaving Italy, did you go directly to North Africa?

WCL: No, for we wanted to see Sicily, as a stepping-stone to North Africa. Sicily was beautiful when we first saw it in the glowing sunset. Mt. Etna towered haughtily above the other mountain peaks. Here we saw extensive and elaborate terracing, even up to one hundred percent slopes. One whole valley was treated with "gradoni."

WCL: There were numerous landslips and debris-laden streams and torrents flowing out of steep valleys, protected by dikes, chiefly of reinforced concrete. The plains were intensively cultivated. There were ten million orange and lemon trees on the island.

It was a long day's drive across the island, and a picturesque and fascinating one as a stormy Mediterranean dashed itself onto the rocky coast line. Land use problems in Sicily were similar to those we had studied in Italy, so we hurried on to North Africa, landing in Tunis on December 30, 1938, in rain and sleet.

Guidelines for Survey in North Africa

Chall: Did you use the same guidelines for your survey of land use in North Africa that you had used north of the Mediterranean in Europe?

WCL: Yes and no. Of course, everywhere we wanted to study lands that had been cultivated for one thousand years or more, as an indication of the establishment of a permanent agriculture. But our survey of old Roman lands in North Africa presented a different situation. As we visited great Roman cities being exhumed from centuries of erosional debris that had entombed them, I always inquired of every archaeologist, "What was the agriculture that supported the people who lived in this city whose ruins you are excavating?"

For seven weeks, we drove our automobile back and forth from the coast to the steppe and desert--6500 miles. We saw the terrific ravages of man's abuse of the land over centuries of occupation, side by side with modern projects of reclamation, conservation and colonization.

But by far the most startling revelations of Roman occupation were what I called the "footprints" of Rome, left in ruins of cities, aqueducts, wells, cisterns, terraces, paved roads, canals, grist mills, check dams for diverting and spreading waters, desilting basins and reservoirs, stone olive presses without number, often in areas devoid of trees.

Near Sousse we examined a survival of Roman olive culture, whose mammoth gnarled trees still grew in basins where Romans had planted them at least fourteen centuries ago. This was another evidence of continuity of favorable climate since Roman

be done in French. Finally Bill argued the man down to 90 cents and became the proud protecting father of the pup, while Wester claimed an equal share in feeing and caring for its needs. Everybody took turns getting up with it in the night. It never knew any home but the Buick, and so it literally fell into six laps of love and attention. We named him "Mektube" meaning "Allah has willed it thus". Mektube was a lucky dog to miss all the abuse he would have suffered in the hands of Arabs, because all of them abuse their animals terribly. For 12,500 miles he traveled with us and we shares with him the food from our plates. His sins of commission, especially in hotels, were finally all washed away when we baptized him in the River Jordan some months later. His cute baby ways and development into puppy adolescence made interesting for us many hours of desert travel. We found our Buick a very elastic car and in spite of six people, six suit cases, six zipper-bags, two typewriters, three cameras, two tripods, an accordion, a box of supplies, a hat box, sleeping bag, extra blankets, emergency food, and numerous other things, we mangged nicely to add the dog and also an extra man for a few hours, and even up to ten days when Walter wished to have someone along for reasons of his work. No one ever fussed about being crowded, but the packing of the car became a fine art, inside and outside.

There was another incident in Algiers I think you might enjoy. We were all invited to the American Consuls to tea. Walter and Bill were to return at 4:00 P.M. from a field trip. The others of us were to go to a Methodist tea at the mission and meet the Bishop, and then arrive at the consulate at 5:00. We left the mission in ample time, took the bus, assured ourselves that it went to the Bellevue and sat back to relax. We continued to turn right when I felt we should turn left. We used English, and poor French, both written and oral, and sign language, but always with the assurance that this bus went to the Bellevue. Finally we started off through the country. We could not get the bus to stop until we arrived in a village about fifteen miles from Algiers just as the clock struck 5:00. I was beside myself. There were no

From "Notes and Impressions on North Africa."

WCL: times.

Destruction of Roman Culture and Agriculture

Chall: What brought about this destruction of Roman prosperity and all their refinements in soil and water conservation?

WCL: Of course, this destruction began with the moral decay and decline in the midst of luxury, and the breakdown of government and law and order, and led to the incursion of the Vandals. The Byzantine occupation stabilized a part of the empire but it was temporary.

It was actually the Arab invasions during the sixth and seventh centuries, sweeping over these North African Roman lands, which destroyed Roman cities, Roman culture, Roman agriculture and even the traditions of agriculture. More than all else, they and their goats set in motion the processes of erosion which have shifted soils and transformed vast areas of formerly productive lands into desert-like wastes of active erosion.

The Arabs, descendents of Abraham through the line of Hagar and Ishmael, are frequently spoken of as "sons of the desert," but after seeing what they had done to the lands of North Africa and the Middle East, I felt it would be more apt to call them "the fathers of the desert." It is they who have transformed hundreds of millions of formerly productive acres into man-made deserts, some of which were being reclaimed by colonizing farmers of France and Italy, while others had been so eroded and gullied that little could be done to make them productive again.

These Arabs were primarily nomadic, and many were still nomads. They cared nothing about a permanent abode or agriculture, but wandered about with their herds, according to the dictates of drought, seeking pasture, and chopping down trees for firewood, or burning them to increase forage for their herds.

One cannot realize the destruction and transformation until one has seen the amazing grandeur and beauty of these old Roman cities that have been excavated from the erosional debris that buried them.

The wreckage of their surrounding agricultural lands was even greater than the destruction of the cities, and more doleful. The surrounding slopes were cut up with labyrinths of writhing

WCL: gullies. The original vegetation and former condition or use cannot be determined.

Wind erosion of lands which had grown wines for Rome had largely covered with sand the glorious city of Leptis Magna. We marveled at its ruins of enormous and elaborate public baths and theaters. One could reconstruct the city, but not the agricultural lands that had supported it.

Traveling Through Tunisia

WCL: One day after traveling for thirty-nine miles from Sousse, Tunisia, over an empty, tawny landscape paralleling an old Roman paved road, and passing only Bedouin nomads and four small clusters of houses not worthy to be called villages, we were startled to see a huge dark mass loom up on the horizon. It grew taller and wider as the miles vanished and began to take clearer form. The light spots became windows and the jagged top and walls took the form of a huge coliseum, with a circumference of twelve hundred feet and a seating capacity for sixty thousand people.

This mass of building stone and marble had been brought by boat nearly two thousand years ago to the coast thirty miles away, and thence was carted overland to the populous and prosperous city of Thydrus, now called El Djem, which was famous for its vast area of olive cultivation.

El Djem

WCL: No counterparts of the life, agriculture, industry and population of the Roman epoch did we see in these areas. We found the dirty tents of illiterate nomads, surrounded by their herds, pitched here and there among the ruins. Our highway passed around the coliseum and over the city that had been completely buried which the French were beginning to excavate. After destroying the city, the Arabs used the coliseum as a fortress.

As the Arabs destroyed the trees and vineyards, the denuded lands began to blow. Wind erosion entirely covered the city and partly filled the coliseum. On our second visit ten years later, we were amazed to see that the enormous amphitheater over which we had first traveled had been excavated along with other important

WCL: portions of the city. There was still much to be excavated and brought to life after centuries of entombment. Sand had preserved what the hand of man had failed to destroy.

Chall: Were there no people living in this area?

WCL: A miserable village had been built on top of the old city, with stones which the Romans had so carefully carved and shaped into beauty, and which had been quarried from the upper ruins of the coliseum. Ragged children were herding their goats. What a contrast to the glories of the past!

Around this region as well as in countless other areas, sometimes treeless, or with only an occasional olive tree as a remnant, we found great numbers of Roman olive presses of stone--Roman foot prints left in the sands and soils of time.

Chall: Was this Roman city of El Djem exceptional or were there others?

WCL: Oh, there were others even more striking. I must tell you briefly about Timgad, Djemila and Speitla, all of which I studied on this early trip in 1939 and again in 1948.

Roman cities were always located to take advantage of streams or springs, no matter how far away, if aqueducts could be built to bring water down by gravity into the city. Some of these aqueducts are magnificent works of engineering. These flowed constantly and emptied into reservoirs for storage. We found it was customary to have running water in city houses.

Timgad

WCL: Timgad, called Thamugadi in Roman times, had a population of about twenty-five thousand freemen and an unknown number of slaves. It was founded in 100 A.D. by the Emperor Trajan at the intersection of six Roman roads. One must see the ruins to comprehend the extreme decline of the city from past glory to present desolation. A brief description may be helpful.

We walked on wide streets, well paved with stone slabs joined diagonally so that chariots rode smoothly. Water had been piped into houses and the city had had underground drainage and sewer systems. We walked on mosaic floors of the public baths and saw the hot and cold chambers, cooling rooms and lounge halls.

We were surprised to see carved marble seats of at least two public "rest rooms," capable of accommodating twenty patrons

WCL: at a time. Arrangements for a continual flow of water below may have been the forerunner of present sanitary flushing. Timgad boasted twenty-two public baths.

We sat in the hillside theater that had a seating capacity of thirty-five hundred. We saw a carved inscription which read, "To hunt, to bathe, to play, to laugh--this is life." We walked down the huge promenade bordered by colonnades and pedestals of statues erected by emperors, governors and local magnates. The handsome Triumphal Arch of Trajan is beautifully carved and preserved. It was the top of this arch, protruding above the sand like a tombstone, that led the French archaeologists to this entombed old Roman city.

We saw the magnificent Capitol on a high point, with its elaborately carved Corinthian pillars. There were numerous temples and a public library with marble columns rivaling the finest works of the twentieth century. This "Golden Age" of prosperity continued for about four hundred years until invading nomadic Arabs killed or drove out the populations and destroyed the cities.

The Arabs, as is their habit, destroyed the trees, while their goats destroyed vegetation and thereby turned the green hills into erosion pavement on slopes or caused them to be riddled with gullies. The Roman water works and cultivated slopes were abandoned to the unobstructed processes of erosion.

With each rain, these unprotected slopes began to wash down into the city and up the fallen pillars and partially-destroyed buildings. Erosion was rapid. Time and erosion finally obliterated the knowledge that a rich and prosperous city had ever existed here.

For twelve hundred years Timgad lay dead, buried and forgotten. It was discovered in 1880 because of the protruding Trajan's Arch, but excavation did not begin until well into this century.

When we were there, only about a dozen small hovels huddled beside the marble ruins of this city. One ragged farmer was gathering the season's harvest of about five bushels of barley from his rocky and gullied farm. He had only this harvest, his small herd of goats, and some coarse woven wool to carry him through another year.

He lived in a comfortless, thatched and mud two-room hovel. The entire family slept on the floor and attempted to keep warm under one family blanket. His lot was similar to that of his few neighbors. The good lands further down the valley were occupied by the French colonials, and even they were poor.

Speitla

Chall: What about the Roman cities of Speitla and Djemila you mentioned?

WCL: Speitla was a Roman city of some 100,000 people that covered several hundred acres and was an important center. It was supplied with water from large springs whose waters were being piped one hundred miles to supply the thriving city of Sfax in the center of the new large olive plantations developed by the French. Very little excavation work had been done, but undulations indicated the oval amphitheater, and carved columns here and there showed the extent of the city.

My interest here lay in the surrounding agricultural lands that showed evidences of remarkable works to control erosion: check dams, and terraces on which olive trees had been planted to the summits of the hills; works for diverting and spreading the runoff from the mountains could still be followed in the valley. These works showed an amazing understanding and knowledge of the principles and details of controlling and using storm waters during Roman times, even into the margin of the desert.

When we were at Speitla, the inhabitants numbered not more than one thousand and were living in poverty. I was saddened to look upon the magnificent Triumphal Arch of Trajan, surrounded by a small encampment of nomads, camels, donkeys and ferocious dogs.

Djemila

WCL: Djemila, a Roman city of some eleven thousand population, at an elevation of three thousand feet, was a fascinating place to which I have returned three times. This was a great center of olive industry; thirty wagon loads of olive seeds were found near some olive presses in the city. Djemila was buried by erosion from the soils which shifted down from adjoining slopes which had been covered with olive trees and vines in the seventh century.

Only one small marble pillar remained as a tombstone to indicate that this was the burial site of a large and prosperous Roman city. M. and Madame de Creselles discovered the site and showed us personally all their excavations and knowledge of the site.

Agriculture and the Romans

Chall: The Romans, you have said, were experts in the control and use of rain and flood waters in North Africa, according to your findings. How did this come about?

WCL: Cato wrote that if one wished to compliment a Roman, he should be spoken of as an "agriculturalist," but they were "gentlemen farmers" who studied the times and seasons, varieties and methods for planting, and ordered slaves to do the work.

When Rome under Scipio destroyed Carthage in 146 B.C., they saved the works of Mago, the Carthaginian, who was considered the greatest authority on agriculture in North Africa, and had twenty-eight volumes of his work translated into Latin. So the Romans had the benefit of the extensive knowledge of the Greeks and Phoenicians who first colonized this region.

But these remarkable works on agriculture were said to have been destroyed when the Arabs burned the great library in Alexandria, the greatest library of ancient times. They believed that the Koran was the only authority, and if facts or ideas were not in the Koran, then they were not worth saving. The destruction of these accumulated works on agriculture were a great loss to the world.

The Moslem belief that whatever happens is the will of Allah takes from them individual initiative. When I chided one Arab for not doing something to stop the enlarging gullies on his farm, he replied, "Allah wills it thus."

Roman rule was cruel and ruthless on subjugated peoples, but it seems to have been extremely intelligent in its conservation and use of rain and flood waters. The French officials took me to examine great numbers of Roman cisterns, many of which the French had cleaned out and repaired and were using.

The normal winter rains had filled them to capacity, even as in Roman times, suggesting that there had been no important change of climate in North Africa in the past sixteen centuries. The people had changed, and the Arabs with their goat culture had changed the face of the entire country, assisted by active soil erosion which this type of economy induced.

French Reclamation in North Africa

Chall: Your land use survey on this first trip in 1939 was primarily

Chall: concerned with old Roman cities and the condition of the lands that supported them. What reclamation works were the French doing?

WCL: Much excellent work in archaeology and historical research had been done in North Africa by Gsell, Berthelot, Gautier, Poinssot, Dr. Lesci, Director Godet and others. Dr. Lesci was Director of Antiquities for Algeria, and was most generous in our land use survey. The French had made practical use of these studies in their large scale reclamation works.

Where they found numerous ruins of stone olive oil presses in deserted areas, void of trees as far as the horizon, they concluded that if plantations of olive trees existed in Roman times, and if there had been no important change of climate, then olive trees should grow again.

This principle was followed in many different ways. Experimental plantations were set out, and there were thriving and prosperous cities developing in the extensive olive plantations that had been established, as at Sfax in Tunisia. We passed large tank trucks with trailers, carrying olive oil to the coastal ports.

The archaeological discoveries of cisterns and check dams and terrace walls in otherwise parched and barren lands indicated that where soils still remained, these lands could again support at least a limited population.

Chall: Were these modern reclaimed plantations as efficient as those of the old Romans?

WCL: No, I do not believe so. The French officials took me to see the one remaining example of Roman olive culture which it appears had existed intact since planted by the Romans at least fourteen centuries before. Huge gnarled trunks of trees verified great age.

These trees were planted four to ten trees in a basin surrounded by an earth bank, or about fifty trees to the acre. These basins were set at different levels. Thus each basin became a reservoir which conserved the rains that fell and was capable of receiving waters that were conducted into them from surrounding slopes.

As one basin was filled, water was directed into the next basin until all were irrigated. This method prevented loss of soil by wind and by water erosion, and conserved the greatest possible amount of moisture for olive culture.

But this method required much hand labor which the French did not want to do, preferring instead to use powered farm machinery. So in their modern plantations, they planted only

WCL: ten to twenty olive trees to the acre and removed all competitive vegetation. This bared soil was already starting to blow, and small dunes were forming, which unless checked, would menace the entire project. Also, on sloping lands small gullies were forming.

I drew this to the attention of French officials. They recognized the menace of wind and water erosion on these bared plantations which had been planted in straight lines up and down the slopes, but they doubted the French colonials could be induced to put their olive trees on the contour. Yet contour plantings would have enabled modern powered machinery to be used, would have protected the land from erosion, and would have been an improvement over the Roman method which required much hand labor.

Chall: What was the outcome of all this time you spent with French officials in the field?

WCL: It was because of these weeks we spent together looking over their land use problems and studying the remains of Roman agriculture that as soon as I retired from the Department of Agriculture, in 1947, I was asked to go to North Africa to advise and to help start soil conservation works and services in Morocco, Algeria and Tunisia. This I did, but I will discuss it later.

It was an advantage for all concerned that I was able to carry on all my work in French Africa without an interpreter, for my French was still fluent from World War I days.

Experiencing Cold and Rain in North Africa

Chall: You complained about the cold rainy weather in England and Europe. Did you find the weather better in North Africa?

WCL: No, for we found the weather as cold as in Washington, D.C., in winter, and sometimes we really suffered with the cold.

And in every country, without exception, we had the heaviest rains that the various countries had experienced in some time. My wife wrote an interesting account of these experiences with rain in an article she called, "The Heavens Cooperate," and they gave us demonstrations of all types of rainfall, runoff and erosion in each country we studied.

We shall never forget our experience after leaving Tunisia en route to Libya about dusk. We were traveling fast when an Arab, traveling in the opposite direction, shouted unintelligible words at us. On we sped when suddenly our road dipped, and we

WCL: plowed into a rushing wadi of storm runoff that sent a geyser of gray muddy water over our car. We were completely blinded for a few minutes.

At another time, we were marooned between rushing wadis that prevented our movement in either direction, and we spent hours sitting in the rain and cold. Once I tried to hire a truck to tow us across a rushing wadi a hundred yards wide, but the driver refused. However, when he started forward, I followed immediately in the broad tracks which were made in the stream bed by the double-tired truck wheels; and in the blackness of night, we reached the safety of the other shore.

Twice more, we breathed the exhaust of this olive oil tank and trailer through waters of unknown depths in darkness on a strange road. Our experiences with rains in various countries are too numerous to recount.

Preparations for War

Chall: In our conversation, you mentioned the preparations for war between French North Africa and Italian North Africa. Were you fearful to travel at this time across boundaries?

WCL: We were always aware of preparations for war, and in crossing borders between French Tunisia and Italian Libya and between Libya and Egypt, we saw how the governments had rolled out their barbed wire teeth and entanglements at each other. We were often met with bristling guns and bayonets, and we experienced their mutual discourtesies toward us, but actually we were only a bit anxious, not afraid.

However, we always inquired in advance as to road conditions and political activities. The American consul in Algiers warned against crossing the Libyan desert. The year before, a car of American tourists had been caught in a dust storm and had gone over a cliff; all had died. In Tunisia, we were told they thought the road was passable, so we decided to start out and go as far as possible. If need be, we knew we could return and take a boat to Egypt.

Libya

Chall: Was the travel across the Libyan desert more difficult than some of the strenuous travel you had already experienced?

WCL: Actually, it was one of the most exciting and interesting roads of the entire trip. As we left a rutty road on the Tunisian border, and crossed the line into Tripolitania, we sped along on a magnificent new road. All comments were, "This cannot last." But it did, for fifteen hundred miles.

We discovered that Mussolini, using ten thousand men, in ten months time had completed this remarkable auto-strad from the Tunisian border to the Egyptian border. Doubtless, El Duce's purpose was for rapid military movement, but we weren't concerned with the purpose as we drove the first civilian auto across the Libyan desert on this new highway.

The immense arch in the center of the highway had only recently been officially opened by Mussolini in person. Carved inscriptions praised Mussolini for this achievement.

Only the power of our engine limited our speed across these miles of desert highway that stretched like a ribbon from horizon to horizon. We were told that one stretch of four hundred miles had not a single curve; we found no exaggeration in this statement. Emergency stations across the desert were built every thirty miles providing restrooms, emergency tools, telephone, water and gas, and we understood food and a bed could be had if needed.

Italian Colonization

WCL: Mussolini had grandiose ambitions to take over all of the old Roman Empire in North Africa to support a greater Italy. This auto-strad was only a first part. More astounding to us was the deluxe colonization work that had been completed. Thirty-two thousand men, of whom five thousand were Italian overseers, performed this second Herculean task.

In seven months, they had transformed 160,000 acres, uninhabited except by nomads, into fully established farms and villages, located near and connected by the auto-strad. Eight new white towns were poured into concrete molds of attractive architectural designs, and seven old villages were rejuvenated.

WCL: The government constructed and donated to the colonists: an attractive church and vicarage, a school and housing for teachers, a drug store, a small hospital and a doctor who had a station wagon containing an emergency clinic for rural trips. We saw the doctor in action. The medical center had licensed midwives.

We saw their cooperative store, the postoffice with telephone and telegraph service, a covered market, a gas station, artisan shop buildings, and a Fascist hospitality center where social and political meetings were held. We were entertained in some centers and saw the beautiful tiled floors and mural paintings on the walls.

All towns were supplied with electricity, running water and sanitary sewage systems. Buildings were artistically centered around a public square, similar to the old Roman Forum. There were modern homes and apartment houses and a hotel with all the services, to fill the needs of the rural areas.

Chall: This must have required an excellent organization to complete all these buildings in a desert area in seven months time. Were they equally efficient in their farm colonization?

WCL: Yes, and this is the most remarkable true story in colonization deluxe that I have seen. I would never have believed it had I not seen it and heard from the colonists that it all happened exactly as planned.

Around these newly built towns, the Italians set out to divide a 160,000-acre tract into eighteen hundred farms of from twenty-five to 175 acres, and have each unit complete and equipped in every detail within a brief period of six months. (In comparison, our colonization scheme in Alaska was a bungled job.)

The government first built roads, dug wells, built reservoirs and irrigation canals. The land of irrigated regions was leveled and all lands cleared for cultivation. Beside each farm house, a two-acre vegetable garden was spaded and prepared for immediate planting.

On each farm was a three bedroom house of reinforced concrete with a large kitchen used also as a congregating place and for guests. The barn was also built of concrete and supplied with a complete set of tools and machinery. In it were a storeroom containing various supplies and seed, a workshed, a pig sty, a manure bin, and stalls.

On the day set for completion of the project and the day of arrival for colonists, all houses were completely furnished, with beds made up, food supplies in the cupboard, and a fire burning

WCL: in the stove. There were two pigs in the sty, several chickens in the coop, two mules in the stalls, and three cows waiting to be milked before supper.

About two months before our arrival in 1938, the first twenty thousand persons arrived in one consignment on boats from Italy. Before nightfall, each family was settled in his new home--warm and cheerful with a blazing fire, a bountiful cupboard, and a milk bucket and stool ready for the proud new peasant farmer who had to hurry off to the barn and milk his waiting cows.

Chall: No wonder you had to see this yourself to believe it. What did the farmer have to pay for all this?

WCL: Well, this new peasant farmer had little to worry about. The government signed a contract to pay him a regular cash subsidy every month until the farm was self-supporting, or for a maximum of five years, and for this period he paid no taxes. After this, he made moderate payments, based on production, and was expected to be complete owner of the farm and all its equipment in twenty years.

We saw hundreds of farms and met some of the farmers and their families working on their new lands. It was difficult to believe that less than a year before, these farms, houses, towns and cultivated fields were open desert range.

Chall: Did all these new peasant farmers come from Italy?

WCL: Yes. A commissioner for migration, aided by many agencies, recruited the peasant families from densely populated regions of north central and southern Italy. The requirements were: that the family of eight or more persons must be of real peasant stock, that each member must be in a healthy physical condition and must have unimpeachable morality; all illiterates were excluded, and most members of the family had to be associated with various Fascist organizations.

Chall: Just where in Libya was this new colonization?

WCL: About half of these architecturally beautiful, newly poured agricultural town centers were in eastern Libya, around the general area of ancient Cyrene on the plateau of the Cyrenian peninsula. The new town of Baracca had 216 new farms, Oberdan, 207 farms, and Battista, 151 farms, and others were about the same in size. A total of forty thousand colonists were planned for this general area by the time the program was to have been completed in 1938.

Italy spent three and a half million dollars to bring water

WCL: ninety-five miles to this farming area which lay at an altitude of nine hundred feet and had an annual rainfall of about twelve to sixteen inches. Where irrigation was impossible because of topography, they used dry farming and forage. Olive trees and others adaptable to dry areas were planted.

It was a beautiful sight, after traveling hours across the desert, to climb on a good highway to this plateau and see the white farm houses against the brilliantly red terra rossa soils just after a rain. Some fields were green with their first crop.

I felt this plateau was worthy of the permanent concrete buildings and that colonization should be successful. Certainly nothing had been left undone that would assist the colonists.

Analysis of Italian Colonization

Chall: Are you implying that you had some doubts about Italian colonization in some of the other developments?

WCL: Yes, I did have some doubts. The equally large colonization projects in the western portion of Libya were quite different. I spoke of them at the time as a magnificent gamble. If the irrigation supply of the Crispi-Gioda region were to work out permanently as well as it did during the first year, then this project, with its hundreds of beautiful concrete houses and barns, could have been successful. If not, and I had my doubts about the water, then it would have been an expensive gamble to lose.

This project was so recent and had been rushed through with such speed, that it was impossible to have accurate data on the quality of the water. I detected some sulphur and a slight salty tasts. My experience in southern California made me concerned both with the lowering of the water table on this flat desert area near sea level, which had only ten inches of rain a year, and with the problem of the accumulated salts in the soil from continued use of wells for irrigation with this brackish water.

But each farm was to rotate dry farming and irrigation over a three-year period. Each farmer was required to plant a specified acreage in olive and almond trees, and sometimes plant vines between, because their extensive root development enabled them to survive drought conditions if surface crops would fail. They also were growing wheat, barley, alfalfa and peanuts.

All produce had to be sold through the government cooperative. But the Italian government had made the entire nation

WCL: assume most of the burdens of pioneers which are usually borne with great hardships by individuals.

Chall: We know the Cyrenian lands were productive in Roman times; was there no cultivation there prior to this colonization?

WCL: Yes, and that is why I had some qualms for the permanency of these projects. The Cyrenian plateau especially was the best area occupied by the Arabs, who swarmed the country with their herds and cultivated the moist spots in primitive ways for light crops of barley.

Those Arabs who first revolted against Italian invasion had had their lands confiscated, and lands were also confiscated for other reasons. There was no place for the Arabs to go except into the desert to the south. The Italians drilled wells for their flocks about one mile apart along the desert section of the auto-strad.

We saw that the desert was already desperately over-grazed. The Italians were building several villages for them, but the general attitude of the Italians was that Arab existence was an annoyance and a deterrent to progress. The Italian officials had a number of plans to do more for the Arabs and the nomads, but whether these plans would change their sullen attitudes remained to be seen.

Italian Officials

WCL: A time or two I felt ashamed to be conducted by Italian officials when we went into some of the larger oases to examine the water supply. The Italians are fond of small birds, which they bake whole after removing the feathers. One crowded oasis under the palms had dozens of small children playing, and many grown-ups standing around. But the officials had all brought their guns, and with no consideration for the natives, they repeatedly shot birds overhead. Just where all the bird shot fell, no one could tell.

We shall never forget the faces filled with hate as we passed among them. During the centuries, Arab nomads have swarmed out of the desert to overrun agricultural lands, and if these sullen, hate-filled Arabs ever had the chance, I feared they would destroy all these beautiful modern towns and cities, as they had the fine old Roman cities and estates in the fifth and seventh centuries.

We were fascinated by the many oases we visited on the fringes of the desert, but I will discuss them in connection with my work in French North Africa as a consultant in 1948.

Cities in Libya

Chall: Apparently your trip across Tripolitania and the great Libyan desert was very different from what you expected and quite astonishing. You only mentioned the newly colonized towns. Were there any old established cities in Libya?

WCL: Yes, and one rarely finds a city more beautiful than Tripoli, with its palm-lined highway all around the water front on the bay. The white Mediterranean houses and colorful gardens and bougainvillaea vines were a joy to see. The hotels were excellent. Everywhere floors were of ceramic tile in lovely designs, or marble slabs. The food was excellent too.

We found that Homs, the modern city replacing the magnificent old Roman city of Leptis Magna, and Misurata and Bengasi, all were up-and-coming Italian cities and a delight to visit. In these cities, we met with Italian officials who were eager to show me what they had been doing in water development and conservation works out in the surrounding countryside.

Libya had been such a delightful travel experience that we were loathe to leave the border station at Bardia and cross over to Egyptian Salum. Now that Libya is rich in its new-found oil, we hope more can be done for the great numbers of very poor people.

Egypt

Chall: You were an official representative sent by our government, so border crossings were made easy for you, were they not?

WCL: Generally so, but certainly not this time getting into Egypt. We had a long lonely road to travel over Egypt's "no man's land," to get to a suitable stopping place for the night at Mersa Matruch. (Incidentally, this was the beautiful beach resort where Cleopatra intrigued Anthony.)

But for some reason, the officials refused to let us start the drive. They were excruciatingly polite and insisted on coffee and more coffee being served, but they refused to bring back our passports. There was one delay after another for about three hours, and this caused us to have the most miserable travel of the entire one and one-half year trip.

WCL: Egypt's "no man's land" had no real road, just tire tracks. What road there was, was rutty and rocky. After a frightening thunderstorm which came on at night, the road was a bog. Sometimes it was necessary to walk ahead with a flashlight and make our own way around bogs. Twice in the darkness we were held up at military zones by shining bayonets, unintelligible words and fierce dark faces. This combination made us very solicitous to obey their "stop" and "go" motions, I assure you.

For some hours we only averaged five miles an hour, and arrived in Mersa Matruch long after midnight, having been in the car a total of seventeen hours. We were thankful that this was Sunday because we certainly needed a day of rest.

Chall: That was a difficult introduction into Egypt. I hope things went better the remainder of the time.

WCL: Yes, but Egypt has an average yearly rainfall of one inch; and the entire annual rain fell on us during our five-day stay there, and we were cold most of the time. Mr. George Reisner, the famous Archaeologist, conducted us to see the antiquities, and into a new set of tombs they had discovered.

The sarcophagus of carved stone they were working on had inscribed the message that these bones we were looking at were those of the "chief slave driver" of all the other slave drivers under the Pharaoh, when the children of Israel were in bondage making bricks for the great building projects of the Pharaohs.

Agriculture

WCL: But what are five days to comprehend the agriculture of seven thousand years, when one sees inscriptions drawn six thousand years ago that show the plow which was still in use, and for which no better implement had yet been devised for conditions in Egypt. Inscriptions also showed the cultivation and selection of wheat, barley, dates, figs and vegetables, which were still growing in the alluvium of the valley floor of the Nile.

The Egyptian official pointed out that the culture of cotton had reached a stage in Egypt about as perfect as could be expected. Yet fertile soils and assured abundant crops had produced no utopia. I felt that here I was seeing the richest lands on earth and the poorest farmers. Most of the land was held by a few rich landlords, and the peasants that worked the land were pitiful in their poverty and afflicted with debilitating diseases.

The problems of civilization, I realized, could not be

WCL: solved alone by increasing the productivity of land. There had to be social justice and help for the masses. We had seen Italy attempting to accomplish this in her land reform, which denied the rich landlords their excess lands and divided them into farms and homes for the peasants.

Critique of the Aswan Dam

Chall: Did you know about plans for the Aswan Dam when you were there? I mean the new big one under construction now.

WCL: No. But as soon as I read about its location, I felt that it would be hydrologically unsound, for it is located in the hottest, dryest part of the world, where loss by evaporation will be a third of the water annually.

Furthermore, I have flown several times over the area and up and down the Nile and realize that the inundation of some fifty thousand acres of good agricultural land, on which lives a dense population that will have to be moved elsewhere, will not be very advantageous. Besides, priceless antiquities will be inundated, even though the world has contributed many millions to remove some of them.

Chall: But Egypt is desperate for more irrigated lands for her exploding population, is she not?

WCL: Yes, but this big Aswan Dam will not do much for the poor farmers of Egypt. Nasser has himself stated that the increased population during construction of the dam will nullify the hoped-for benefits.

But if only nations would cooperate for the benefit of all concerned, what wonderful things could be accomplished. I know personally and have talked with Mr. Y. M. Simaika, the noted Egyptian engineer who worked with the two brilliant British engineers, H. E. Hurst and R. P. Black, when England was in control in Egypt under King Farouk, about the Century Storage Plan.

He sent me the reprinted edition of The Future Conservation of the Nile, which book shows the enormous amount of preparatory work already done. They said in 1951 that work must be begun in a year or two in order to be completed in twenty-five years, to take care of the population which Egypt would have by 1980. But sadly enough, nothing has been done about this brilliant project which would provide a better way of life for the Egyptian people.

Chall: Just what is this Century Storage Plan?

WCL: The Century Storage Plan would use the Aswan Dam in Egypt only as a flood control reservoir. The storage for the Nile waters would be obtained by raising the outlets of the great lakes in the headwaters of the Nile on the great central highlands of Africa. Here rainfall is very heavy and evaporation very light in that tropical area on the equator.

With comparatively easy engineering works, the outlets could be raised a few feet and these great central African lakes be made vast storage reservoirs, to provide the regulation of Nile waters for an abundant supply continually for a century at a time. These lakes are Tana in Ethiopia, Lake Albert and Lake Edward in Uganda, Lake Rudolf in Kenya, and the enormous Lake Victoria on the equator, bordering Uganda, Kenya and Tanganyika.

Tropical waters stored over this vast area where evaporation is no consideration would supply storage to give Egypt perennial waters in abundance at the times when needed most, regardless of droughts.

In the Sudan, over which I have flown seven times, are the great Sudanese marshes. By conducting the Nile River through these marshes by a canal, the waters which have historically flowed into Egypt would continue to do so. Yet enough water would be saved to irrigate the reclaimed peat swamps, of some five to ten million acres, for agriculture. Besides, the fall of these waters from the lakes in the central highlands would provide great hydro-power projects for all the nations concerned.

So here is the type of unified and coordinated use of river drainages that would benefit all countries bordering the river drainage. A Nile River power and irrigation project, such as this Century Storage Plan, may be beyond the cost any one country could assume, but well within the finances of a unified plan which could be backed by the World Bank.

Instead of backing ambitious dictators seeking their own prestige, we should have the moral courage to say to these nations, "See here, you fellows get together on this project which is for the benefit of all of you. We will help you develop your countries to the greatest extent possible, but you must work together to make a better life for all of you who live in this drainage area." But for some reason, we do not do this.

Chall: This seems to be a brilliant project and one that could be achieved from an engineering standpoint. Has anything been done to implement it?

WCL: No, not to my knowledge--and twenty of the twenty-five years it would require to do the work have already passed.

WCL: But I have been advocating for years, that water is going to be the critical factor for many nations in the coming years, and during my year in the United Nations headquarters in New York, working on an over-all water policy for the United Nations, I suggested that the United Nations assist in the engineering and development of many of the important river basins of the world that are shared by two or more nations, for the benefit of all concerned.

Water is the lifeblood of a nation and peoples will fight for it perhaps more than for anything else. They have done so since time immemorial, and the situation gets more acute annually as exploding populations demand more and more water for our modern civilization and way of life.

Crossing Into Palestine Through Sinai

Chall: Did you go from Egypt to Palestine by boat or overland? I believe this was the time of considerable Arab-Jewish trouble.

WCL: Yes, and we saw evidence of the trouble at the totally destroyed border station where wires were dangling, gates were down, and nomads glared at us as their goats ate up the former well-kept gardens.

The Egyptian officials told us that no one had been known to cross into Palestine by car for several months, and advised us not to attempt crossing by auto. I had wanted, however, to see Sinai; so when we were told that there were no bridges, but that the road should be passable, we decided to continue on with our plans and turn back only if unsurmountable difficulties arose, and then take a ship from Port Said to Beirut. But we made the trip.

We left Egypt via the route of the children of Israel and traveled to the "Promised Land" in two days instead of forty years. From the appearance of the desert, Moses and his followers and their herds must have overgrazed it beyond the powers of nature to repair in three thousand years. The naked slopes were festooned with countless goat paths, but no visible vegetation. During one seventy-mile stretch, we saw only two thorny trees along the entire road.

In the "no man's land" of Egypt, we were the first auto to cross in six months. There were only camel tracks visible and

WCL: sometimes small sand dunes were in process of crossing the road, but the proverbial rains, which sometimes were the first in months or even in two or three years, arrived as usual in our pathway and made the sand passable.

Camel caravans shied at us and the Arab nomads stared at us in astonishment. They were without guns but all carried long knives. We managed to travel faster than a camel could run so that no one ahead could be warned of our coming and prepare an ambush.

Naturally, as we crossed Sinai, we thought of the Biblical crossing of the children of Israel three thousand years before our journey. We were interested to locate an extinct volcano that could have been "the pillar of fire by night and the cloud by day." Also we found small amounts of manna, which fed the Israelites bountifully on their journey. It is a sweetish, gum-like drop, from a certain shrub seldom found today, that has a distinctive flavor and was not at all objectionable to us.

Then the Old Testament relates that when the Israelites complained of the monotony of this manna, the Lord sent quails and many people died of over-eating. This miraculous phenomenon also happened the year we crossed. Generally the quails when migrating fly directly across the Mediterranean to North Africa; but there are times when for some reason--adverse winds, or something else--the quails fly diagonally across. This is a much longer route, and they drop exhausted on the shores of Sinai. This had happened just before our journey.

When we arrived in Beersheba, a sleepy little border town (certainly a contrast to the last time we visited it as a rip-roaring progressive pioneer city), the British Tommies of the British Mandate were so astonished to see our lone automobile entering from Sinai--the first in six months--that they forgot to stamp our passports. So when we arrived in Jerusalem, it appeared to officials that we must have dropped from an airplane, car and all.

Palestine

Chall: Did the Mandate officials know of your coming?

WCL: Yes. There had been much correspondence between our Department of Agriculture and officials of all countries we were to visit,

WCL: and everywhere we were welcomed and preparations made at once to enable us to see and gather information on whatever we wished.

Chall: Were you informed before leaving the United States, either by the Jews or by books or articles you had read, on what you might expect to find in Palestine?

WCL: No. I had no more information in mind about Palestine than about Libyan colonization or about the alarming destruction of lands and cities of Roman North Africa. I had a completely open mind to see and evaluate whatever I found. The most I knew from Bible history was that at the time of Moses, the "Promised Land" was said to be a "land flowing with milk and honey," which sounded like a pastoral paradise.

Chall: Had the Mandate officials made arrangements as to where you were to stay and where your headquarters for your survey of Palestine were to be?

WCL: Yes. The Mandate had appointed Amihud Goor, Mandate head of forestry, and his brother, Assaf Goor, chief horticulturalist of the Mandate, both graduates of the University of California, to be responsible for all arrangements which were made for me to see everything I wanted to examine. I was told that even though this was a period of Arab-Jewish hostilities, we would be given a military escort when required, so that I could make my land use survey as planned.

We were delighted when we found that our headquarters and home for this Middle East survey were to be in the American School of Oriental Research, in the heart of old Jerusalem. Our quarters were large enough to accommodate our family and the secretary, Cleveland McKnight, and we had an office room in which we could carry on a heavy correspondence and write our reports.

Surveying Palestine With Archaeologists

WCL: In this compound at the American School of Oriental Research, which was directed by Dr. Nelson Glueck, lived the famous archaeologist, Dr. Clarence S. Fisher, who was an authority on dating artifacts and pottery. Also, there were Sir Flinders and Lady Petri, who together had spent most of their lives on "digs" in this part of the world. Sir Flinders was considered the veteran archaeologist and was looked upon as Dean. He was elderly and took part in "digs" only when Lady Petri was able to raise money for them.

He was very much delighted when he found that I too was

WCL: interested in the lands, and how they were farmed in ancient times, and what had happened to them, and how they could be reclaimed, and whether or not there had been an adverse change of climate.

His studies had convinced him that there had been none of importance. The people had changed and brought in an economy of goat culture that had destroyed the ancient refinements in agriculture and thus allowed erosion to destroy the productivity of the country. We spent many hours and days discussing "agricultural archaeology," for I was one of the first he had found who shared this interest.

Then in Jerusalem lived the British Director of Oriental studies, P. L. O. Guy. We talked much about agricultural archaeology and together we took many days of field trips. Guy had made special studies of the Judean hills and counted the ruins of ancient villages on the slopes which had been abandoned when soils were washed off to bedrock.

His careful estimates indicated that more than one meter of soil had been washed off the hills to bedrock, leaving only a few dregs, or pockets, of soil in the ravines; and these were being gouged out with each winter's rains.

We examined how the forests, newly planted by Jewish settlers, were growing: their roots seeking out the soil pockets in the limestone country rock, making it appear that they were growing out of rocks. The last time I visited Israel, the Jews had planted on the rocky slopes more than seventy million trees that looked like green emeralds in an ugly setting of surrounding sun-bleached rocks.

P. L. O. Guy took us through Trans-Jordan on a field trip, and down into the spectacular rose-red ancient Nabatean city of Petra, reached only through a narrow, deep gorge where the Nabateans had hidden their capital city in this easily defended desert gorge and carved out their temples, public buildings, and tombs from solid Nubian sandstone.

We slept in these tombs for five nights, as we examined the ancient cisterns and their methods of collecting water to last through the long dry seasons. They made remarkable use of flood waters for growing orchards and grains in thie region of very low rainfall. One record states that on these surrounding slopes, the olive trees appeared to be a forest. These Nabateans developed a fascinating period of history, flourishing about the same time as the Golden Age of China--200 B.C. to 200 A.D.

I also took field trips with Nelson Glueck and rejoiced in his painstaking studies. He was the principal authority on this

WCL: ancient Nabatean civilization, its cities, fortresses, farms and water conservation works. To have these well-informed students of this part of the world as guides was of great benefit to me.

I was with Dr. Glueck at Jerash when he discovered a bronze age site. It was interesting that whenever he found a bronze age site, there was sure to be a spring nearby or evidence of a spring that had been trampled in by herds and had become a marshy seep.

On the other hand, Dr. Glueck told me that he often found iron age sites far removed from streams and springs. At these sites he found cisterns of large capacities dug into rocks that were water-tight with plaster made from burned limestone. These were used to store water for nomads and their herds.

The common practice was to divert storm runoff from slopes, preferably bare soil surfaces, into the cisterns. We also found that these cisterns were protected from wash of eroded material by silt-traps and baffles. This indicates that somewhere between late bronze age and early iron age, these nomadic peoples had invented the burning of limestone country rock, and discovered how to convert such burned limestone for mortar that, when plastered over walls, made these cisterns water-tight.

Trans-Jordan

Chall: You mentioned taking field trips into Jordan east of the river with Dr. Nelson Glueck, the Director of the American School of Oriental Research, and P. L. O. Guy, Director of the British School of Archaeology. How were the people of Trans-Jordan using their land at the time?

WCL: I wrote two reports. One was titled The Lost Agriculture of Trans-Jordan; and in my book, Palestine, Land of Promise, I devoted a chapter to "Trans-Jordan, Past, Present and Future."

For a soil conservationist, the study of Trans-Jordan when I was there in 1939, presented a tragic comparison with the past. The region's agricultural development had reached its greatest height under the Nabateans from the 4th century, B.C. to 200 A.D. and continued through the domination of the Roman and Byzantine empires.

Trans-Jordan presented the same old story which I found across North Africa and throughout the Middle East. Jordan's ancient civilization was built on farming and trade, for it was the back corridor through which north-south caravans passed from Damascus, in Syria, to Egypt, and from Arabia, via Petra, to the Mediterranean

WCL: at Gaza. Trans-Jordan was once one of the granaries of Rome. It is estimated to have maintained at least a million people of considerable wealth, as is evidenced by ruins of elaborate temples, churches, public buildings and pillar-lined forums. There was ample surplus to export to Rome also.

But after the break-up of Roman and Byzantine power in the 7th century, Trans-Jordan was overrun by one conqueror after another and exposed to wave after wave of plundering desert hordes of Arab nomads, who overran the well-tilled and laboriously protected fields. Their herds of goats broke down the terrace walls which, when thus neglected, fell into ruin along with the works for the conservation of rainfall and irrigation. Then erosion, the great enemy of civilization, took over the country for the remaining centuries. Only small remnants remain of former forests.

In spite of Trans-Jordan's large stretches of remaining fertile soil, the comparative abundance of water which surpassed my expectations, the many thousands of ancient cisterns which could have been cleaned out, repaired and used, and the healthful climate, Jordan's population as we found it was in great poverty. Most cultivation was very primitive, and crop failures periodically resulted in famine, requiring the importation of food.

Geographically, Trans-Jordan has always been linked with Palestine west of the Jordan, for their economies are complementary so that together, they are an economic unit. It was partitioned off by Churchill from the Jewish national home by Great Britain in 1921 when she had the Mandate, and at that time prosperous Jewish Palestine carried Jordan's deficits.

Later England subsidized Jordan and more recently the United States has spent some half billion dollars there. It appears Jordan cannot be self-sufficient as a separate unit unless some other resource, aside from extraction of minerals in the Dead Sea, is discovered.

Meeting Leading Scientists and Officials in Palestine

Chall: Although the land use picture in Trans-Jordan was depressing, it must have been quite exciting to be with Dr. Glueck when he discovered a heretofore unknown site from the bronze age.

WCL: Yes, it certainly was. All my land use surveys in Palestine were in association with British and Jewish authorities who were experts after years of studies in their various areas of interest.

WCL: I had great admiration for these men and the conclusions of their discoveries.

I was also grateful for the assistance of the late Adolph Reifenberg, one of the best soils men of the Middle East, with whom I apent much time in the field. I also spent time with Dr. Ruppén and Mr. Volcani. The latter was an authority on Arab agriculture and crops, their traditional methods of fertilizing, cultivation and treatment of soils. He tried to make the best use of what Arab farmers of the region had learned throughout the centuries as a foundation on which to apply scientific methods and modern technology for Jewish agriculture.

It was interesting to see "before" and "after" fields of wheat and barley, where the Jews were sometimes able to increase production from the average Arab harvest of seven bushels to seventy bushels to the acre on the same field after modern methods were applied.

Professor Leo Picard, a noted geologist who was and still is the leading authority on ground water in the Middle East, was always helpful, as well as Mr. Goldschmidt, a hydrologist who set up instruments to measure stream flow of perennial and seasonal streams and the depth of water in wells.

Mr. G. N. Sale, chief forester for the Mandate, was most helpful, along with Amihud Goor, who arranged for us to stay with his deputy forester, Mr. Lahov, on Mr. Carmel, Haifa, where their forest plantation was growing beautifully. Just over the fence, the slopes were grazed clean by goats as though they had been shaved by a razor.

I also want to mention Mr. F. R. Mason, the agricultural officer of the Mandate, who was most helpful in arranging for me to see all that was being done by the Mandate.

It is important also to give credit to the very fine work being done in Rehovot in the Agricultural Experiment Station and at the Sieff Institute, where we first met Dr. Chaim Weizmann, the world famous chemist--who later was to become the first President of Israel. Here began a fine friendship which lasted until he passed away.

Also at this time I met Dr. J. L. Magnes, president of the Hebrew University. This friendship, begun in 1939, led me last year to donate a part of my library on the Middle East to the Magnes Memorial Museum and Library in Berkeley, near where Dr. Magnes had his childhood home.

In speaking of the remarkable cooperation I had for my land use survey in Palestine, I must mention my appreciation to the

WCL: High Commissioner and others of the Mandate government--the Royal Air Force which furnished a plane to give me a "bird's eye view" of the country as a whole.

Also much appreciation goes to the Jewish Agency for the generous supply of information and photographs, and to the Hebrew University and the generous assistance of members of its staff, and to the Rehovot Agricultural Experiment Station for much valued information from its fund of significant experimental data and analyses.

Also, I want to express appreciation to those agricultural colonies, or settlements, for their hospitality and the unstinted time they gave us in showing and explaining the work of the settlement.

Evaluating the Settlements

Chall: It must have been interesting and satisfying to make your land use survey with experts in each field to give you the benefit of their studies and experience. Will you tell us more about these agricultural colonies, or settlements?

WCL: I feel overwhelmed by that question, for it is hard to express briefly the far-reaching meaning of these settlements. I was totally unprepared for what I found here. I said shortly after my arrival, and thereafter never have changed my opinion, that here in Palestine I had found the finest reclamation of old lands that I had seen in three continents, and the most successful agricultural settlements that I had ever seen anywhere.

After seeing the destruction of the land, of agriculture and the traditions of agriculture across many thousands of miles, and then to come to Palestine and find people who loved the land, who paid high prices to the Arabs to buy swamps and drain them, even at great loss of life from malaria, who bought rocky slopes at prices that would buy lands on the hills above Hollywood at that time, who picked up the rock and rebuilt the ancient terraces, who cleared out boulders on valley lands in order to plow and sow and plant orchards and vineyards--this was an expression of a love of the land that I had never seen anywhere.

Palestine, the "Promised Land," had become a man-made desert after centuries of neglect and wastage by Arab nomads and their goats, throughout four hundred years of corrupt rule by the Ottoman Empire. The Ottomans taxed each tree so that it was an advantage to the farmers to cut their trees rather than pay the exorbitant taxes, and this, and the goats, had reduced the country

WCL: to poverty and desolation that made reclamation seem impossible.

For any individual farmers to undertake such Herculean tasks of reclamation under these difficult circumstances would have been impossible. These Jewish agricultural settlements were, in my opinion, the best possible solution. Their splendid achievements on six percent of the lands of Palestine at that time served as models for reclaiming other lands in Palestine, and in fact, many other parts of the Old Roman Empire.

Balfour Declaration

WCL: The great impetus for this reclamation work came with the Balfour Declaration in 1917 which stated:

> "His Majesty's government view with favor the establishment in Palestine of a national home for the Jewish people, and will use their best endeavors to facilitate the achievement of this object, it being clearly understood that nothing shall be done which may prejudice the civil and religious rights of existing non-Jewish communities in Palestine, or the rights and political status enjoyed by the Jews in any other country."

This area included the lands settled by the ancient tribes which, according to the Old Testament, had been promised to Abraham and his seed forever. This small area of 45,000 square miles of the million square miles of the defunct Ottoman Empire was to be for the Jewish National Home, and the remainder of the million square miles was given to set up Arab states under the Mandates of England and France.

Chall: What were some of the reasons behind the Balfour Declaration, as you know them?

WCL: One of the most important probably is the fact that Dr. Chaim Weizmann contributed enormously to the British victory over the Turks by some kind of a discovery in the use of TNT explosives. When the war was over, the British wanted to express their appreciation to Dr. Weizmann and offered to make him a Lord and to give him an estate or any other honor he wished. He replied that he wanted his people to have a right to settle on the ancient land of their forefathers as promised to Abraham.

This was the main reason for the Balfour Declaration. But there were also two other factors. We know well from what is left of the Aaronsohn family. They lived near the Mediterranean

WCL: Sea where signals could be flashed seaward from inside an upstairs room. They kept General Allenby, Commander of the British forces, informed regarding Turkish military movements, so that the British were able to anticipate where and when the Turks would strike.

We have been in the home of the Aaronsohn family many times and have seen the outbuilding from which signals were sent and contacts made. We heard and read firsthand the fascinating story of the Nihli group who thus worked to insure a British victory in many different ways. Some members of the Aaronsohn family suffered torture at the last when the Turks discovered their secret.

Another reason the British proclaimed the Balfour Declaration is that when their backs were to the wall and they were desperate for help, they appealed to leading Jews of England and elsewhere for help. None asked for anything except the return of their patriarchal homeland.

With the Jewish national homeland assured, the Jewish National Fund was formed to raise funds to buy up available lands and hold them in perpetuity for the Jewish people and bring them back into productivity again. It was on these newly purchased lands that all these remarkable reclamation works of the Jewish agricultural settlements had taken place in various forms of organization and development.

Report on Settlements

Chall: Did you make a report on these agricultural settlements?

WCL: Yes, I did, and I remember that it was almost fifty typewritten pages long. It was called, "Jewish Colonization in Palestine," and was first published in the Menorah Journal shortly after my return--probably in 1940. I shall not enlarge on my findings here, for they were so important and results so far-reaching in their significance to land reclamation, that the subject deserves far more than a discussion here.

Arab-Jewish Problems and the White Paper

Chall: You mentioned at first that the Mandate government agreed to furnish you with armed convoys when necessary for you to see certain areas. Why should this be necessary?

WCL: This was a sad and tragic story that I found taking place in the Holy Land in 1939. The British Mandate, shortly after accepting the Balfour Declaration in 1917, began to renege on its promises for several reasons. The Jews accepted the idea of a Jewish National Home and began at once to implement it in good faith, but they were progressive and aggressive and in earnest. They paid high wages to the Arabs who poured in from surrounding Arab lands to share in better wages and in the progress. This brought in new and revolutionary ideas.

The British had dealt with the Princes of India, the Pashas of Egypt and the rich Effendi of the Middle East, and left them to their age-old racket of exploiting the masses. This new leaven would permeate the area and topple, in time, this long-established policy. This Jewish development must be stopped, so they thought, before it undermined the old order.

So the first thing the British Mandate did under Winston Churchill as Prime Minister was somehow to obtain the agreement of the United States to permit the Mandate to take from the Jewish National Home four-fifths of its area of forty-five thousand square miles, and set up an Arab state. They put Abdullah on the throne and called the new land Trans-Jordan. This left the Jewish national home only 10,500 square miles between the Jordan River and the Mediterranean Sea. The British then said that no Jews could live, buy land, or do business in Trans-Jordan.

This is an uneconomic area when cut off from the coast, so the British made the profitable Jewish portion west of the Jordan pay seventy percent of the taxes that maintained the unprofitable Jordan portion of the railway and government. Trans-Jordan remained backward, but thousands of its Arab citizens poured into prosperous Jewish Palestine.

During this period, the Mandate operated its "divide and rule" policy, which had wider and wider repercussions. Italy and Germany hired Arab terrorists and paid them $7.50 per month--which then was a considerable wage for that part of the world--to cause all the trouble they could to embarrass the British government.

Finally, while we were there, the British got tired of the Arab terrorist disorders and issued their White Paper. This was a breach of the honor of Great Britain. This White Paper maintained that there was no further economic absorptive capacity in Palestine and therefore all Jewish immigration was to cease shortly, except for a trickle, though no limit was set for the rapid influx of Arabs from surrounding countries. Also, one British consul said to us personally that the British, because of oil, decided their interest lay with the Arabs.

Chall: This White Paper must have been a great blow to the Jewish pioneers

Chall: who had given such devotion and sacrifice to restoring these ancient lands of their forefathers.

WCL: The reaction of the Jews in Palestine was as if stunned by an almost fatal blow. I remember Nelson Glueck saying, "I'm afraid the jig here is up. The British are out to crush us."

Their concern was increased, for at this time Hitler was on the march and tens of thousands of Jews were fleeing Poland and Czechoslovakia and other areas, and were paying exorbitant sums to board old vessels of racketeering captains, to flee to safety elsewhere. But all ports were closed to them, including (due to the White Paper) this one place in the world allotted by the League of Nations as a Jewish national home.

Developing the Idea for the Jordan Valley Authority

Chall: I understand that you challenged the British officials on this idea that there was no further economic absorptive capacity for Jews in Palestine.

WCL: Yes, I did. I drew attention to the fact that the Jews were bringing their own economic absorptive capacity with them as they transformed unproductive swamps, bad lands, rocky hills and boulder-strewn valleys into highly productive orchards and farms.

Having lived in California and studied how California brings water from distant sources for irrigation, I suggested that the Palestine government could make use of the unique geographic resources of the area: the Jordan, in the well-watered north, which flowed down into the Dead Sea thirteen hundred feet below sea level to be wasted in evaporation, could be conducted down to the fertile but drought-ridden lands around Beersheba, where two or three crops a year could be grown.

The Yarmuk River, flowing into the Jordan from Trans-Jordan, could irrigate the east banks of the river where there is much good land. The former Jordan stream bed could become a wasteway for irrigation waters to evaporate in the Dead Sea. Then the Dead Sea waters could be increased by bringing in salt sea water, dropping it these thirteen hundred feet through twin power plants, thereby creating a generous amount of electricity for industry.

This was a constructive plan that would have enabled the little country to absorb great numbers of Jews escaping Hitler and provide as well for people in all of Mandated Palestine, on both sides of the Jordan. But for this constructive plan, the British and the Arabs both called me "that damned Lowdermilk."

Chall: Why wouldn't the British accept your proposals?

WCL: This did not agree with their plan to obstruct the development of this energetic new movement in Jewish Palestine. However, this project did have far-reaching results later on which I will discuss when we take up my report to the Anglo-American Committee, and it came up again in my work in Israel during the years 1950-1957.

Chall: Did you have any idea at this time that after your retirement from the Department of Agriculture in the United States, you would return and work in Israel?

WCL: No, I actually I did not. Yet my wife remembers my remark, as I watched a winter rain sweep off the soils from the hills of Judea to turn the Mediterranean into a muddy brown, "When I retire from the Department of Agriculture, the thing I would most like to do would be to return to Palestine and put farming of the Bible lands on the contour and stop this terrible wastage by soil erosion of these sacred lands." Twelve years later, this dream began to come true.

But while there is much, much more to tell about this early period in Palestine, I shall delay discussing it until we get into that period during which I returned as a consultant with FAO.*

The Eleventh Commandment

Chall: While you were in Palestine at that time, didn't you give a talk which included your famous Eleventh Commandment?

WCL: Yes. That radio talk was somewhat momentous, for in that talk, entitled, "Gone With the Rain," given in Jerusalem, the Holy Land, in June, 1939, I gave for the first time what I called "The Eleventh Commandment." It has since then been given many times, and has been translated into many languages, and was spoken at the close of each radio "Farm and Home Hour," from Columbus, Ohio, for years. Also tens of thousands were printed and given to school children in rural areas of the United States, as well as enlarged and hung in schools.

Years later, I was told by a friend that while he was hiking on the north rim of the Grand Canyon, he sat down on a bench to rest, and immediately opposite him, he saw on a carved wooden

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*Chapter XV.

WCL: plaque attached to a tree, an engraving of the Eleventh Commandment. For a time, it was published by the Soil Conservation Service without giving me credit, but that slip was later remedied.

Chall: What is the Eleventh Commandment?

WCL: I always began with the brief explanation first of man's moral responsibility to maintain and safeguard the Holy Earth for succeeding generations as a moral responsibility. For our responsibilities to Mother Earth that feeds us are akin to those to our Creator and to our fellow men.

We expressed this obligation as an Eleventh Commandment which Moses doubtless would have been inspired to deliver to the Israelites, had he foreseen how the Promised Land and billions of acres around the world would be damaged by the ignorance, negligence and suicidal exploitation of lands of succeeding generations.

The Eleventh Commandment is as follows:

> Thou shalt inherit the Holy Earth as a faithful steward, conserving its resources and productivity from generation to generation. Thou shalt safeguard thy fields from soil erosion, thy living waters from drying up, thy forests from desolation, and protect the hills from overgrazing by thy herds, that thy descendants may have abundance forever.
>
> If any shall fail in this good stewardship of the earth, thy fruitful fields shall become sterile stony ground or wasting gullies, and thy descendants shall decrease and live in poverty, or perish from off the face of the earth.

Chall: How did you get the idea for the Eleventh Commandment?

WCL: I saw that wherever mankind had lived longest in organized society, the lands, with few exceptions, were in worst conditions. As a result, there was seared into my soul the tragedy of lost cultures and civilizations because of the wasteful occupation of the good earth. It seemed to me that there should have been some kind of a warning or guideline.

In the car as we were traveling through a man-made desert, we discussed the desolation of the lands of the cradle of Chinese civilization in northwest China, and the old Roman lands of North Africa and the Middle East, and thought on the rapid destruction of our own lands of America in so short a time. The

WCL: Eleventh Commandment just seemed to write itself.

The ancient lawgiver, Moses, declared that the sins of the fathers would be visited upon the children to the third and fourth generations. In no case is this more true than in man's misuse and wastage of natural resources, especially of lands and waters upon which a people depends.

I feel that land, the struggle for it, the fight to keep it, to live on it, and the quest for sufficient food and riches from it, is all important in this world where now populations are literally "exploding" at unprecedented rates. For, as I have said so many times, "Civilization is running a race with famine, and the outcome is very much in doubt."

Iraq

Chall: From your Jerusalem headquarters, you said you made trips to adjoining countries. To which country did you go first?

WCL: Our itinerary included a side trip to Mesopotamia, the land of the Garden of Eden, of Ninevah, Babylon, and the story of the great flood when Noah built the ark, the story of Daniel in the lion's den and of the fiery furnace, and where the Israelites were carried to Babylon as captives. We knew little of this fabled land except from the Old Testament and, later, the Arabian Nights.

We had been warned not to try to cross the Syrian Desert or steppe until after the spring rains, and to go before the great heat and dust storms that come very suddenly, so we chose to set out at the end of March, 1939. It turned out to be a very exciting, dangerous and interesting side trip that was quite different from our carefully laid plans.

Following the Pipe Line Through the Mud

WCL: There were no real roads at that time; one followed desert tracks or navigated by compass or by the stars. But as I was a representative of the United States government, the Iraq petroleum officials invited us to be their guests and to follow wheel tracks along the pipe line which ran from Kirkuk, Iraq, across to the Mediterranean at Tripoli, Lebanon. This gave us the assurance that as we went from one pumping station to the next, they would keep track of our arrival time, and if we failed to show up, they

WCL: would search us out on the vast open desert.

We were assured that our time-table was just right, but the proverbial rains, which had followed us in every country and all seasons, certainly did us a wet and muddy trick this time.

In the late afternoon of the second day, the heavens opened up and it began to rain. Soon we were stuck in the mud. The fluffy soils of the desert become soft when wet and soon mired our car. The family scoured the desert for rocks where there were few, and at last we dug ourselves out of the mud.

This Syrian desert or steppe is unlike anything physiographically and botanically that I have ever seen in my far-flung studies in land use. At that time of year it was a great flat carpet of green, uninhabited except for the occasional black tents of Bedouin nomads, spread out like giant bat wings on the desert. The herds of sheep, goats and camels reminded us of Abraham and his flocks as he traveled across this very same steppe from Ur of the Chaldes to the Promised Land.

We traveled on until dusk, first along one track and then another. But darkness fell and blotted out all signs of the pipe line. The desert is absolutely smooth. Although these steppes have been grazed for ten thousand years or more, they have two remarkable annual plants--a wild buckwheat and a blue grass (Poa simiaca). These dry up, and winds, during the great heat of 130° in the shade if there is shade, level off all hummocks that have formed and make the desert almost as smooth as pavement, except for innumerable piles of dried-up mud which show where cars have had to be dug out.

Suddenly we sank down into a bog. It was black night and we could do nothing but sit in the car until morning. Once during the night, we saw a glow on the horizon. We blinked our large flashlight in that direction and saw the headlights of the car swing toward us after a time. The car rolled up to find our difficulty and sank down in the bog beside us. Out spilled six or eight white-robed Arabs.

We could not communicate with words, but our jack lifted them out of the muddy vise, and then our tow rope broke as they tried to extricate us. Neither their supplications to Allah, our jack or tow rope, could move our big car. So with motions, they set out to Pumping Station T.2. to notify officials of our predicament.

Three trucks were sent out in the night to rescue us. One got stuck in the mud, one got lost and the other had a puncture. The one with a puncture changed wheels and finally picked up our headlights. The truck that was lost eventually picked up the

WCL: light on the one stuck in the mud and pulled it out. The truck that found us ran around our car in circles until his light was seen by the others as a glow over the horizon. The three trucks and our car had a happy reunion about 2 A.M., and before long we were having a hot dinner (which included desert truffles, used instead of potatoes) at Pumping Station T.2. We sank into bed about 3 A.M.

The next day we literally slid down into the Euphrates Valley and wound our way through mud puddles to Bagdad and Kish where daylight routs all the glamour of Arabian nights.

Chall: The hospitality of the Iraq pipeline officials to your party was a lifesaver. Did you have further difficulty with these unseasonable rains?

WCL: We certainly did, and on each occasion, it was the help and hospitality of these officials that almost literally saved our lives.

This was a time of rising Arab nationalism, and the Arabs were extremely anti-foreign. In addition, Germany and Italy were stimulating riots against the French and British. We were held by rains in Mosul, the modern Nineveh, though certainly a mess today in comparison. The situation was becoming very dangerous, and instead of delaying in Mosul in unbearable accommodations, we chose to drive to the oil fields of the Iraq Petroleum headquarters at Kirkuk.

It is well we got out when we did, for King Ghazi, whom I had met and taken a picture of, cutting the ribbon at the opening of a new irrigation dam, was killed in a car accident. The vicious rumor was spread that the British were responsible for the death of the king.

The mob then raced to the British Consulate, not far from our hotel (and we had a British auto license) and burned the Consulate and killed the consul, by stoning him to death. We had arrived in safety within the high steel wire-fenced compound eighty miles away at Kirkuk, and were thankful for it.

One day I left the compound to take pictures of local scenes here at this ancient "Tel," but became alarmed when some teenagers began to heckle me and I hurried back into the compound. After being there several days we left, accompanied by an I.P.C. truck, to haul us out of the mud if necessary, as far as the next pumping station near the Tigris River. By our arrival at lunch time, it seems that the same youths who had heckled me only the day before had started a riot that had killed two Jews.

There were no bridges over the Tigris in this northern area, so the I.P.C. arranged for our car to be swung up on their cable

WCL: to a height of about seventy feet. Out across the river we slid, dangling and swaying over the angry flood waters. As our car shifted at the opposite shore, my wife, by jumping aside, just escaped being crushed to death.

On our return trip, again the unseasonable rains caught us and we were held up at one of the pumping stations for three days, but they were comfortable and restful days. Incidentally, Mr. Anderson, the director of the Iraq Petroleum Company, told us confidentially that they knew that the reserves in that Kirkuk oil field were sufficient to allow oil to be pumped at the present rate for eight hundred years before they would be exhausted. He said they did not want the Arabs to know this, for when they made out a new contract, they hoped to get a lower rate on the premise that reserves were being depleted. Twenty-nine years have now passed and the yield is even larger.

Decline of the Garden of Eden: Erosion and Silt

Chall: You evidently had some narrow escapes in the traditional Garden of Eden. Were you able to make the land use studies you had planned?

WCL: Yes, and while it was a fascinating experience, it was also a sad one. On my return, while held up by rain in one of the I.P.C. pumping stations, I wrote "Reflections in a Graveyard of Civilizations," in which I told of visiting the sepulchers of early civilizations here in this cradle of mankind, where eleven civilizations had risen and fallen in the past seven thousand years.

The twelfth, Iraq, had about five million people in 1939, as against thirty to fifty million in ancient times. Except for a few, the population lived in poverty, ignorance and squalor, against the background of magnificent ruins of palaces and ruins of one of the Seven Wonders of the Ancient World, the Hanging Gardens of Babylon, now heaps and piles in a salty desolation.

This great alluvial plain of Mesopotamia is a garden or a desert, depending entirely upon the maintenance or the neglect of its irrigation canals, for overhead rainfall is insufficient for agriculture. Ancient prosperity depended on keeping these canals open. A standing army of slaves for this task was required to toil without ceasing on the endless removal of silt from its canals.

The Iraq Department of Irrigation estimated that the Tigris and Euphrates rivers brought down four million cubic yards of silt from over-grazed mountains and foothills in the north where

WCL: nomads had grazed their herds since before the time of Abraham.

Our travel log en route from Bagdad to Mosul shows that in a stretch of 106 miles, we passed through ninety-eight of these miniature mountain ranges of silt, anywhere from ten to fifty feet in height. As the canal walls mounted too high for the silt to be lifted over, it was found easier to dig a new canal beside the old one, which was then abandoned.

The mountain building of silt cleanings then began all over again. Once our road passed through eleven consecutive ranges of silt banks. Each bank had been built to excessive heights, and then the canal was abandoned and a new canal dug. The twelfth was a small live one which carried a streamlet to a small area of land. It was common to cross three to six abandoned or dead canals beside a live one.

Growth of ancient civilizations here depended on enlarging the irrigation system until these lands of Mesopotamia are estimated to have supported up to fifty million people. They became rich, powerful, luxury-loving and soft. Covetous eyes of food- or land-hungry nomads from surrounding grassland regions were cast again and again on the rich valley, and they swept down to pillage and destroy. But it would be impossible to have exterminated such vast populations.

However, during wars or invasions, if the vast army of workers did not maintain the constant cleaning of canals, they rapidly silted up. Then the life-giving waters ceased to flow and cities famished immediately when irrigation and city water canals ceased to function. So silt here too proved to be the great curse and destroyer of civilizations. The land, and these clogged irrigation canals we saw, have remained desert for five hundred years since the whirlwind invasion of Tamerlane.

Cain and Abel

Chall: Do you think that people generally realized the part that erosion has had to do with the rise and fall here of eleven civilizations during the past seven thousand years?

WCL: No. I believe few realized the true meaning of these vast networks of abandoned canals, stretching herringbone-like on either side of these two great rivers, with their banks of miniature mountain ranges of silt. Neither do people seem to realize that in this part of the world, the truth of the Old Testament story of Cain and Abel, Cain, the farmer, killing Abel, the shepherd, in Cain's own field.

WCL: This conflict still is the curse, as it has always been in this part of the world. During times of drought, or over-population of nomads and their herds, these sturdy and fierce denizens of the desert or steppe swooped down on cities and farmers to loot and destroy. Sometimes they themselves settled down, only to be destroyed later by another invasion of nomads.

The Cain and Abel story is one of the oldest in the world, but it has been repeated since time immemorial, and will continue to be until there is a beneficial co-existence worked out. The farmer must raise fodder for dry seasons to feed the nomad's herds, and they in turn must furnish farmers and city dwellers with meat supplies so that their economies are complementary. Only then can both Cain the farmer and Abel the shepherd feel secure.

Chall: You make the Cain and Abel story very realistic. I presume you had other experiences that related to Old Testament times.

WCL: Yes, and one of the interesting ones was our trip to Kish, possibly the first capital after the great flood, which we know actually took place. I took a picture of a forty-inch layer of silt that had been laid down on the pre-deluvian artifacts found on top of the great stratum of silt at the base of Kish. We assume that this great flood was that referred to when Noah built the ark and rain came down for forty days and nights. Such a rain would have caused a great flood in any land.

My wife got tired following me about the excavated ruins of Kish taking pictures, and went to a Bedouin nomad's camp nearby with a local woman who spoke their language. They were hospitable, especially the countless flies which flew from one eye, red with trachoma, to another; and she fought continually to keep them from her own eyes, for they were desperate for moisture in the heat. The Bedouin women did not bother to brush these flies away, even when the flies formed a black row around the lower lid. Never again did my wife agree to visit at a Bedouin camp in summer heat.

Chall: Was there much blindness?

WCL: Yes, that was one of the sad sights in the Middle East in 1939. But today in Israel, trachoma has been entirely eradicated among all the population, Israeli and Arab alike. Hadassah Hospital in Jerusalem has developed a serum to prevent trachoma. If only the Arabs would accept the blessings that Israel has to offer them!

Old and the New in Iraq

Chall: Was the government of Iraq doing much for the people?

WCL: No, I would not say a lot, considering the oil royalties. But I was fortunate to meet Iraq's Director General of Agriculture, M. Radi, a graduate of the University of California. He took me to see their eight thousand acre experimental farm and their program which, if it could have been carried out, would have done wonders for the region.

There are vast expanses of land suitable for irrigation. Through our American Minister there, Mr. Knabenshue, we were invited to attend the opening of the first diversion dam to bring back some of these ancient irrigated areas.

Incidentally, we were guests of King Ghazi, and the feast that he gave was indeed unique. There were several barbecued camels, and inside the camels were barbecued sheep, and inside the sheep, barbecued chickens, and inside the chickens, baked eggs. The three hundred special guests of the king ate first--of course, with one's fingers. Then lesser guests were invited to come to the feast, and finally the poor and the beggars came to eat off the carcasses.

My wife is still indignant, for she was invited and of course accepted and was thrilled to have dinner with the king. Then our U.S. Minister, Mr. Knabenshue, sent a note to say that she had been invited out of courtesy to me, but that she must remember that she was in an Arab country and as a woman she was expected to stay at home in the hotel. Sure enough, at this great public celebration, there were no women.

The next evening, we had dinner in the home of M. Radi. He was trained at the University of California and his lovely wife, at the University of Beirut, so in his private home, the women could sit at the same table and eat with us men.

We discussed the opening of this first diversion dam to begin to bring back some of the glories and prosperity of ancient Babylon. I said, "I suppose that your country will put in more of these diversion dams?" and he replied, "No, not now, for we do not have enough farmers to utilize the lands which this one diversion dam can bring into irrigation."

I then suggested, "Why not invite Arab farmers to immigrate in from some of the other Arab lands so that Iraq can more rapidly develop the country?" His reply was immediate, "Oh no, we prefer to born our own population."

WCL: Enroute home, we commented about how right the ancient prophet was when he said, "Where there is no vision, the people perish."

Iraq: Empty Breadbasket

WCL: My land use studies in this almost empty cradle of civilizations have convinced me that if this well-watered valley of alluvial lands could have supported thirty to fifty million people in such wealth and splendor in ancient times, it could have done even better in 1939. With modern irrigation works and machinery to excavate silt, along with modern conservation dry farming on the surrounding highlands, this valley could have become one of the most prosperous areas in the world. Oil royalties could have paid for all the new developments.

My opinion is still that this is one of the greatest unused "breadbaskets" in all this hungry world. Yet with all this potential and need for greater population to develop it, the Iraq government was not willing to take in any of the Arab refugees from Palestine, though they all have the same race, language, religion, customs and background. When can Iraq gain even a portion of its ancient greatness if, as the Director of Agriculture stated, they "want to born their own population," in the backwardness that exists today?

Babylon

Chall: Apparently you were quite disappointed in this legendary Garden of Eden.

WCL: Actually, I was deeply saddened. We were all subdued, as though at a funeral, as we gazed upon all that remained of mighty Babylon, the greatest center of culture and civilization known to the ancient world. The only evidence of life in this once teeming city was a lean gray wolf, shaking his head as though he had a tick in his ear as he loped to his lair among the ruins of the famous wonder of the ancient world, the Hanging Gardens of Babylon.

We remarked, "My, how the mighty are fallen." As the prophet predicted, Babylon had become a heap and a pile, a desolation wherein no man dwelleth. We visualized the stirring events of history that had taken place on the great street, the triumphal processions of conquerors and the loot-laden slaves; and we thought of the groaning oppressions of millions of wageless human beings that enabled the rich to live in such luxury and leisure.

WCL: Why should eleven civilizations rise, wax and wane in this well-watered alluvial valley? These fallen and vanquished civilizations are dead and could not speak, but their ruins and the living remnant of their peoples, long sunk in a night of illiteracy and dull from crushed or suppressed higher human values, provided a warning. We must undertake a vast and healing program of conservation in its wider sense. In it are bound up self preservation, altruism, justice, ethics, liberty, freedom and those realities which are the basis for democracy and its spiritual values.

In conservation we have the assurance of continued progress in the search for that something which has led humanity out of the stone age to a modern mechanical age of development. With this goal of full conservation of human and natural resources, our much-vaunted modern civilization will not be plunged into the mausoleum of vanished cultures where lie in dust and ashes the achievements of mankind during thousands of years of struggle, which I had just seen in this graveyard of eleven civilizations.

Lebanon

Chall: This study in ancient Mesopotamia seems to have made you fearful that modern civilizations could go into oblivion even as these ancient ones. Did all of your side trips in this part of the world affect you this way?

WCL: No, for our next side trip for land use studies was to the north of Palestine in Lebanon, just a day's journey by car from Jerusalem to Beirut. This little country, located on a small coastal strip and extending over the Lebanon mountains to Syria, was fascinating to me. Here, I am convinced, mankind first recognized the menace of soil erosion and with ingenuity discovered a way to control it.

We know that about 5,300 years ago, a Semitic people settled in this area. Their harbor towns were Tyre and Sidon and Byblos. The mountains were covered with the famous cedars of Lebanon. As population increased, the farmers began cultivation of the steep slopes that had been bared of the cedar trees, which were a product of their commerce. Records showed that they delivered cargoes of cedar trees to Egypt as long ago as 2900 B.C. Cultivation was pushed further and further up the steep slopes until finally in places, they reached the tops of the ridges, up to five thousand feet altitude.

WCL: Of course the bared slopes began to erode. The ingenius Phoenicians began to build rock wall terraces to hold the soils in place and to prevent erosion. Those terraces which had been maintained were still growing food, as they had done continuously for perhaps five thousand years. At Beitadin was the most remarkable example of rock terraces from the valley floor to the ridges. They had been maintained for several thousand years and were still growing foods. But where rock walls had not been maintained, the soils had washed away entirely and left the bare skeleton rocks of the limestone mountains.

Few places in the world exceed the Lebanon Mountains in the extent of their terraces. Even the ancient Inca civilization in South America, which had been forced under economic pressure to terrace its hillsides for cultivation for survival, did not build such a vast network of terraces as I found here in Lebanon.

Phoenician Terraces

Chall: Were these a type of terrace that we would build today?

WCL: Oh no, for we would consider that they were uneconomic. Their cost has been terrific in patience and labor. Terracing is often continuous from the depth of the valley to the topmost ridge, covering an altitudinal range of four thousand feet or more. Frequently on steep canyons, the height of the terrace is equal to the width of the level bench of land, showing that the slope had a grade of one hundred percent, or forty-five degrees.

Canyon after canyon appear as huge amphitheaters or stadiums, with gigantic rows of stone benches, tier upon tier, reaching a thousand, and sometimes two thousand, feet up the canyon walls. Human hands over long periods of time built the hundreds of terrace walls, reaching thousands of feet in height. The cost of building such walls of stone today would be thousands of dollars per acre.

Chall: The population pressure and need for food must have been great to make farmers undertake such terracing of mountain slopes as you describe.

WCL: Yes. But these Phoenicians had only two choices on their tiny coastal plain and steep mountains, and it appears they accepted both. They cut the cedars for commerce and sold them all around the ancient world, and also farmed the slopes. They were a seafaring nation, and from time to time, groups left the crowded homeland and settled in colonies in various places around the Mediterranean; great Carthage was one of these Phoenician

WCL: settlements that grew into a powerful city.

I believe that wherever these Phoenicians settled, in North Africa, Sicily, Cyprus, southern France and Italy, they carried with them their agricultural practices, and for this reason we find the areas they settled terraced with rock walls, many of which are in existence today. Greece was too powerful, so the Phoenicians did not attempt colonization there. Greece therefore does not have the rock wall terraces, and soil erosion has scoured soils from the slopes, bringing poverty to the many generations who have tried to eke out a living on the impoverished slopes.

Problems of Farming the Terraces in Lebanon

Chall: Do these terrace farms that have been kept in repair yield good crops today?

WCL: No, not unless proper fertilizers have been added, for soils are impoverished from long use. Cattle dung is used for fuel instead of fertilizer, and no other measures of restoring to the soil the plant nutrients extracted in the crops have been taken that I could find. Abundant rains still fall, warm sunshine caused rapid growth, but we found that the lack of nutrients in the soil caused us to suffer what one may call hidden hunger, which left us exhausted and weak, though we ate a well-rounded diet at our Pension.

Professor Najjar, of the American University of Beirut, who assisted me with some of the field trips, estimated that throughout the Lebanon range there were some two thousand small towns, villages and hamlets. With the mountains occupied by so large a permanent population as well as by numerous herds of goats, it was difficult to formulate a definite program of land use best fitted for the slopes.

In some valleys they had achieved a permanent agriculture by the infinite labor and patience of generations of farmers. When terraces were once built, their regular maintenance was a simple but never-ending task. One great difficulty in the way of land and terrace maintenance was caused by the custom of turning out the goats on the terraces after the crops were harvested. These long-eared black goats have been and still are the curse which accelerates the processes of erosion and reduces once-productive lands to sterile barren slopes.

Cedars of Lebanon

Chall: Apparently the Phoenicians brought fame to the cedars of Lebanon and in turn, the cedars brought profit and renown to Phoenicia. Will you tell us something more about these cedar trees?

WCL: Probably no forests in human history have been so famous or so bound up with the development of ancient civilization, or so frequently mentioned in ancient literature, as have the cedars of Lebanon. Long before 3000 B.C., the Phoenicians began to ship cargoes of cedar wood to Egypt. All ancient seafaring nations used these cedars to build their ships.

Palaces and temples of the ancient world, extending from the Nile to the Tigris-Euphrates rivers, were adorned by these cedars. There are very many recorded references to this extensive trade. Many of these records I referred to in my article, "The Cedars of Lebanon, Past and Present."

Also we know that the Romans set boundaries to the cedar forests and maintained a certain control on cutting, from 63 B.C. to the Arab invasion in 630 A.D. Henceforth little or no effort was made to preserve forest growth, and year by year they dwindled. The ubiquitous goat grazed back seedlings so that the stands failed to reproduce themselves.

Chall: Were you able to find any of these cedar trees still growing in the Lebanon Mountains?

WCL: Yes. There were, in 1939, three groves left which I visited. The largest was the Tripoli Grove consisting of some four hundred trees, but only forty-four of them were the ancient giants that may have been a thousand years old or more. No annual ring counts of complete tree sections could be made, since the trees were strictly protected from cutting. These oldest veterans were enclosed within a wall built when a Marionite church was established there. The largest measured forty feet around the base of the trunk. This grove was at an altitude of about six thousand feet.

The Barouk and Massa groves were smaller and less accessible. The Tripoli Grove was near the main highway leading over the mountains from Beirut to Bualbek in Syria.

I found this survey of the Lebanon Mountains, its cedar forests and the work of the remarkable Phoenicians, whom I believe were the first to recognize erosion and to do something about it, one of the most interesting parts of this land use survey in the Old World.

Visiting the Human Cargo Boats: Jewish Refugees

Chall: What else did you see or do in Lebanon?

WCL: During our stay in Beirut, we had one of the most shocking experiences of our lives. An old, one-funnel cargo boat loaded with 655 refugees from Czechoslovakia fleeing Hitler, was unloaded at the quarantine station for four days only. They were without food and water, but the reason they were landed was that the old boat was so overrun with rats that people were taken off to exterminate the vermin to prevent an epidemic that might reach shore.

We obtained permission to interview the refugees. We found they had been floating about for eleven weeks, packed into little wooden shelves built around the four cargo holds. The congestion, the ghastly unsanitary conditions and sufferings that these people had undergone aroused our highest admiration for their courage, and our indignation at what had befallen them in our supposedly enlightened age.

For eleven weeks, they had floated about in the terrible heat of summer. All had contracted scurvy from malnutrition. We were astonished to find that these Czechoslovakians represented a very high level of European culture. Most spoke several languages and some told us their stories in English.

Of the 655 refugees, forty-two were lawyers, forty were engineers, twenty-six were physicians and surgeons, and in addition, there were women doctors, professional writers, gifted musicians, pharmacists and nurses. Two had been staff officers of the Czech army and sixty had been officers before Hitler dissolved their army. There were also many skilled workers and craftsmen.

Without passports, cast out from mother countries, these highly cultured and useful refugees presented to us one of the most tragic spectacles of modern times. What a stigma upon our modern civilization! What, we thought, had become of our conception of the infinite value of the individual? We felt deeply that it was long past due for the Christians to give the Jews a "new deal" and would henceforth do what we could to help wipe out this greatest blot of the centuries on Christendom.

Chall: I see that this tragedy of the Jews had much influence on your thinking and on your future actions.

WCL: Yes, it did, but that will come in later discussions.

Syria

Chall: Where did you go after Lebanon?

WCL: As usual, we returned to our headquarters in Jerusalem to write reports, get mail, and make arrangements for the next place we were to visit, which this time was to be Syria.

Chall: What did you discover in Syria that particularly interested you?

WCL: I thought that I had found the worst erosion in my land use studies in northwest China, in the labyrinths of deep gullies in the loess, or wind-laid soils. Then I had studied the magnificent old Roman cities that had been excavated from the erosional debris in the man-made deserts of North Africa. But in northern Syria, I looked over a landscape of one million and a half acres of formerly productive lands where erosion had done its worst.

Here the land was not riddled with gullies, the cities and villages had not been covered with erosional debris, but stood high on their rock foundations on the limestone slopes from which three to six feet of productive terra rosa soil had been washed away. Here we found about a hundred Dead Cities.

These were not cities in the common sense of the word but villages and market towns which were in an almost perfect state of preservation (of the masonry), and seemed more to have been asleep than dead for thirteen centuries. In reality they were dead, dead, dead and with no possible chance of resurrection.

This erosion-devastated area was in reality a huge graveyard in which the towns and villages of cut stone stood like tombstones, weathered into a monotonous grayness like that of the exposed country rock of the rolling hills. The good earth was completely gone except where walls of ruined buildings had held back small patches of the former terra rosa soil. In these patches a few vines or olive trees stood as sorry remnants of a former profitable land use.

The town of Rouweiha, as I saw it silhouetted against the evening sky, appeared as a modern city devastated by war or fire. Many of the villas and churches had roofs and could have been made habitable. The cut stone was of such excellent quality and workmanship that sculpture and mouldings in intricate designs had resisted weathering and centuries of abandonment. I almost had an urge to search among the ruins for inhabitants, but had to force myself to realize that they had been dead for thirteen centuries.

The Dead Cities: Erosion at its Worst

WCL: This erosion at its worst lies in a strip about ninety miles long and twenty miles wide, between Antioch on the west, ancient Berea, now Aleppo, on the northeast, Apamea on the south, and Chalcis on the east. In this man-made desert, I was fortunate to be conducted about by Dr. Alford Carlton, President of the Aleppo American College, who was, I think, the first to study the lost agriculture surrounding these ruins.

Though it was one of the hottest periods of summer, we chose to visit the areas of Jebel Riah and Kalaat Samaan, where we found most of the largest towns. From one point, we could count fifteen "dead towns." The rolling foothills, once clad in vineyards and olive orchards, were gashed with deep ravines where here and there, small pockets of red soil had lodged. A few goats were finding meager pickings, and we saw some scattered sordid houses where lived a mere fraction of the numbers of former progressive population.

We made special studies of the ruins of Gerade, with its beautiful villas and markets and homes with their elaborate carved rock mouldings around doors and windows. The inhabitants of these fine homes were Christians. They did not "hide their light under a bushel," but used the cross and other Christian symbols in their rock carved decorations. Their numerous and spacious churches indicated a zealous and religious population.

Here in this graveyard of villages were the ruins of the largest church built prior to the eleventh century, and it may even have been the largest church built in the Near East. I was astonished to find the immense sanctuary of St. Simon. It was 325 feet long and 290 feet wide, with a total area of 94,000 square feet. The rooms, baptistry and facade were almost intact, but the arched roof of the huge octagonal central room had collapsed. This room was of particular interest because it housed the sixty-five foot pillar upon which St. Simon lived for thirty-seven years until his death in 459 A.D.

Saint Simon

WCL: St. Simon was the inspiration for this magnificent Christian church. He was a humble monk who tried to get away from the world by living on top of a pillar, first thirty-three feet high and gradually raised higher and higher. Simon, the Stylite, was born about 390 A.D., and became a monk at the age of thirteen. His mortifications of the flesh astonished other monks. He could remain in his cell through the entire period of Lent without nourishment. He loved solitude but he got none, even on top

WCL: his high pillar, for pilgrims came from far and near to ask his advice and prayers.

After his death, crowds of pilgrims from the four corners of the Christian world continued to come in great numbers and contributed the funds to construct this magnificent church to enclose his pillar. As I meditated upon the countless pilgrims who had journeyed here during the five hundred years when the church was in use, I felt more like a pilgrim myself than a conservationist trying to appraise the land use of the past in this area.

The Dead Cities: Prosperity and Destruction

Chall: What kind of a tragedy could take place to reduce such a prosperous and flourishing land and people to total destruction?

WCL: I too contemplated on how to account for ruins of luxurious cities and buildings constructed of choice material in a manner to endure the ages. The region was now denuded, poor, meagerly supporting a few hundred miserable families. How could one explain the former populous centers of prosperity? Whence came such wealth which permitted people to satisfy their artistic tastes with this unusually fine Syrian artistry, only found in this region, and carve it into their homes, churches and public buildings?

The evidence is that at that time there was an ample supply of excellent timber, as we could see by the notches for beams in the walls. So we knew that in time their forests were used up. We knew by the frequency of towns that there had been an intensive agriculture that supported the large population and grew an abundance of wines and olive oil for export. We found wine and olive presses in great numbers.

In Italy, the "Hill of Testaccio," on the Tiber, was entirely formed by the debris of the huge earthen jars of wine and olive oil shipped from this region, and then transferred to smaller jars for sale. Also, this region before man and erosion transformed it into a man-made desert was well-supplied with water. But when there was no more soil, springs and streams dried up except during floods.

The possibility of an adverse change of climate has been reviewed elsewhere. The indications were that there had been no appreciable change since Roman times, but again we found it had been the old Cain and Abel story. Ancient cultivation up through the Roman period had been intelligent, and demonstrated

WCL: an understanding on the part of the inhabitants of the conservation of soils and rain waters by check dams, rain water basins, and terracing. These important measures, I suspect, first came from the Phoenicians. At that time, the region was highly prosperous, populous and flourishing.

But in 633-638, the Arab invasions swept away progress in agriculture. The vineyards and olive trees were destroyed and the land was reduced to patch cultivation, to grain crops, and heavily grazed by goats. After the destruction and dispersal of the former population, there was neglect of the land, especially under the four hundred years of Turkish domination.

These Arab nomads practiced a Neolithic type of agriculture, moving constantly with their herds, seeking pasture, chopping down trees or vineyards for fuel. These nomad invaders and their goats have worked hand in hand here with erosion to destroy the productivity of these once beautifully fertile lands.

Here, in this area of the Dead Cities of northern Syria, man and erosion had devastated these lands for a geologic age. Here, the unpardonable sin of land use had been committed: the cities may house the people, but there would be no land to support them. These ruins of cities and the lands that sustained them told the tragic story of the terrible curse upon the land and future inhabitants when soil erosion is permitted to despoil the soil and water resources. We must conclude that conservation of the soil resource is a sure foundation for the existence and continuation of an enlightened culture.

Water Resources in Syria

Chall: This soil wastage must have been very depressing to a land conservationist. Did you find any brighter conditions in Syria?

WCL: Yes, and my studies convinced me that Syria has remarkable potentials for far greater development and prosperity. It is decidedly an under-developed country. It has enormous supplies of water for increased irrigation and lands on which to develop irrigation.

In the northeast, Syria has first access to the waters of the mighty Euphrates River, which flows through her territory and on through Iraq, much of it to be wasted into the sea. Besides, the Orontes River nearer the coast, with its picturesque ancient Persian water wheels squeaking loudly, which have been used to lift irrigation waters in limited quantity probably since before the time of Alexander the Great, has been under use

WCL: since Roman times. Also, the great massif of Mt. Hermon, rising to more than nine thousand feet, with its abundant rains and snows falling on its porous country rock, with great crevices for storage, has through the centuries stored vast and unmeasurable quantities of water in underground aquifers, available for pumping for irrigation.

Also, I visited Damascus, the oldest known city in the world with continuous occupation. This city has flourished throughout time because of great springs that pour forth clear, sweet waters in abundance. At the spring, the water is divided into seven canals to conduct water to various areas for irrigation in this region of scanty rainfall. I rejoice when I find untouched or little-used resources that can be developed to grow food for the exploding populations of the earth.

Baalbek

WCL: There were many evidences that Syria, in Roman times, was an exceedingly prosperous and populous land. The ruins of Baalbek were the best preserved and showed a type of grandeur which could not be compared with any others we had seen. They are some of the most magnificent ruins in the world. I have visited them twice and meditated on the civilization and prosperity which brought forth these massive edifices whose construction would challenge modern engineers.

The foundation stones were sixty-four feet long, thirteen feet high and thirteen feet wide, brought from a quarry about a mile away. But even more remarkable was that the massive monolith pillars of red granite had been quarried at Asswan in Egypt, shipped six hundred miles down the Nile River, then across the Mediterranean to the Syrian coast, where they were unloaded and then actually rolled by human hands over a five thousand foot mountain pass across the Lebanon mountains and down into the Bekaa and to Baalbek.

What enormous local wealth must have been required to construct and pay for such a temple to their gods. I have a multitude of pictures for all the things I have seen, but pictures cannot do justice to Baalbek in its huge and massive ruins. Many giant pillars were tumbled in a great earthquake, but masonry was so excellent that much of the structures remained in place.

Other Ancient Sites

Chall: These ruins must be one of the great tourist attractions!

WCL: Yes, they are. But I was also excited in contemplation of what had supported Palmyra and made it great, lying as it does hidden at the edge of the mysterious desert of Syria. Here Queen Zenobia long defied the Roman legions. Its beautiful paved city streets, lined with great columns with their ornate capitals, and ruins of a great forum indicate a large and prosperous population living then in an area that today is bleak and desolate and only able to support a very small population of nomads and their herds.

We were also especially interested in Byblos, one of the oldest cities in the world, that was being brought out of its grave after being buried for centuries in debris. Its fascinating past was being reconstructed through archaeological finds.

Of course, we visited "Egbert," that young old man thirty thousand years old, who had been discovered in 1937 in a paleolithic cave home, covered with forty feet of debris. Fathers Ewing and Doherty discovered his skeleton while excavating a paleolithic site near Beirut. We had to climb down a ladder to see him as he lay only partly exposed.

The long and significant past of this part of the world is beginning to be made known, but thus far, little attention has been given to the fate of the land which has been cleared and cultivated, terraced and wasted through the centuries to supply the food and textiles which made possible the rise of man out of barbarism into a condition of high culture in the arts, in construction of magnificent buildings, in refinements of conservation of lands and waters.

But must mankind thus struggle upward, only to be wiped out, along with his works, by nomads and their herds in the age-old story of Cain and Abel which has brought such destruction on old Roman lands of North Africa and the Middle East?

Cyprus

Chall: You said your last survey in the Middle East was the island of Cyprus. Was it an interesting land use study for a land conservationist?

WCL: Yes. I found in the island of Cyprus what I call, "The Epitome of Land Use in the Mediterranean," and wrote it up in a forty-four page typewritten unpublished report. Also, I wrote a report of more than forty pages, "The Itinerary of a Soil Conservationist in Cyprus," which was published in The Soil Conservation Magazine.

I was interested in the description given by the historian L. Von Suchen in the fourteenth century: "Cyprus is an island most noble and fertile, most famous and rich, surpassing all the islands of the sea and teeming with all good things. It is productive beyond all other lands."

It has been said that the eastern Mediterranean cannot be fully known without seeing Cyprus. Because of the location, climate, geology, topography, soils and agriculture of Cyprus, one finds within the comparatively small area of 3,500 square miles, the essential features of the problems of the Mediterranean in land use and in conservation of soil and waters. This island was the prize in ancient times, first, because of its extensive forests sought after by rising ancient civilizations bordering the Mediterranean, and second, for its copper.

Even in Solomon's time, Cyprus was famous for its wines, grain and olive oil. The long and bloody struggle of empires in the Old World has usually enacted scenes on Cyprus. The island has been a meeting place of Aryan and Semite, the West and the East, of Egypt and Asia, of Christian and Moslem, so that the people of Cyprus have been influenced greatly by winds of favor and adversity. These political changes have also affected the use of the land of Cyprus more than in any other corner of the earth.

Forests, Old and New

WCL: For ten hot days in midsummer in 1939, I was conducted to many places of special interest by Mr. G. W. Chapman and Mr. Unwin, both of the Mandate Division of Forestry. During our first day out, they showed me an old olive tree that measured thirty feet in circumference at breast height. Later they showed me what I believe must be the largest fig tree in the world. There were a number of them, each one covering about one-half acre. Their branches stretched out, supported every few feet by wood props. It is said that the figs grown on one tree will support a family for a year. These trees were an astonishing sight.

From time to time, other Cyprus officials joined our party. They showed me a remarkable spring near which were neolithic sites dating around 4000 B.C. This spring supplied water in

WCL: Greek and Roman times to ancient Salamis, through a fine aqueduct which was one of the wonders of Cyprus. From all indications there has been little change in the discharge of the spring.

At forest headquarters of the Kythrea division, we saw what forest protection can do in thirty years. When forests were protected from grazing and fire, the growth was remarkable and indicated the dense forest cover of ancient times. Except where protected, the slopes were bare of all growth but thorn bush.

We drove to, and then hiked up to, Pilarion Castle, a famous landmark on the summit of a mountain peak, overlooking the sea. Rain water caught in cisterns furnished the sole water supply for the many people who lived there in centuries past.

Lime burning was an important activity, but fuel was a serious problem. Private forest holdings had been disastrously cut out for fuel.

Mr. Pitcairn, Mandate Director of Agriculture joined our party to show me special areas where they had introduced contour trenches in cooperation with farmers, as well as check dams and the planting up of gullies. At the agricultural experiment station, research was confined chiefly to agronomic studies for improvement of strains of wheat. Soil and water economy was not yet being studied, though it seemed to me most important of all.

En route to the Troodos forests, we stopped at some important copper mines of the Cyprus Mines Corporation. Americans--Mr. and Mrs. Ricker--entertained us for lunch. For centuries, all mining had ceased, probably because there was no further fuel available for smelting, even though there still was an abundance of copper ore available. The mines had been flooded. I was given pieces of the ancient wood that had been impregnated with flecks of pure copper and preserved during the centuries.

Troodos is the summer capital of Cyprus at an altitude of 6,403 feet, the highest mountain on the island. Entering the Troodos forest, we first examined the Aleppo pine stands and higher up, the black pine forests. Troodos forests enjoy forty to fifty inches of rain yearly.

We studied the erosional debris fills, brought down from overgrazed or cultivated slopes. The land use history here would be a fascinating record of man's adjustment to the land through the centuries. But unfortunately writers have come from ruling or professional classes who had only indirect relation to or interest in the land.

Erosion and Silt

WCL: The peasant farmer or serf has always been relegated to an inferior position in society and has not been granted the advantages of learning. Exploited as they have been throughout the centuries, it is little wonder that tillers of the soil have in turn exploited the land. They have toiled without advocates and seldom with defenders on the long rough road of the march of civilization. Some indirect references in ancient writings permit us to make assumptions, along with our present-day findings.

Chall: Most of our information about Cyprus at present seems to be the political squabbles between Turkey, Greece and Cyprus. One never reads of the present-day condition of the land.

WCL: It is true that Cyprus today is a political mess in many ways. Inhabitants do not seem to feel that they are Cypriots, but continue to use the language and customs and to live together with groups of people from the country from which they migrated. It is a small island that should feel a close unity for its progress, but instead it is at times a bloody battleground where people destroy one another.

Chall: Did you find startling evidences of excessive erosion in Cyprus as you did in most other places of the Middle East?

WCL: Yes. There were numbers of instances, but I have pictures of one which interested me greatly. When steep slopes were bared, the heavy rains caused excessive flooding that gradually elevated the flood plain, as we found near Asha. An old Byzantine church and yard had undergone a series of floods. As one approached the church, he suddenly found the land and road were level with the top of the wall about the church and cemetery.

We looked into what seemed to be a pit or sunken yard, eight feet down to the level of the church yard. We entered the church and found the floor three more feet lower than the yard. Then they drew my attention to the fact that the old closed-off door arches were short, as if the floor level had risen.

The eighty-year-old attendant at the church then told us that about sixty years ago, a great flood came which silted up the church to a depth of about thirteen inches. Rather than clean out the silt, the authorities built a new floor pavement over the silt. Thus the total fill since the first flood was calculated at twelve feet, one inch in depth of silt, from erosion brought down onto the plain from the adjoining slopes.

Another striking case of silting was found in the lagoon between the ancient city of Salamis and the present-day city of

WCL: Famagusta. Formerly the town of Engomi was on the lagoon, but now it is two miles from the present shore line. No mention was made of this lagoon until the end of the fourteenth century when one writer spoke of it as becoming a marsh which gave rise to "bad air" which caused fever and sickliness of pilgrims on their way to Holy Places. This was malaria, which the British government had eradicated. Cyprus was again a healthy place in which to live.

Solutions to Land Use Problems

Chall: What would you say were the critical problems in Cyprus in land use?

WCL: In my opinion, the conservation of rainfall supplies was the key problem in the agriculture of Cyprus, for water is the critical factor in agricultural production. In view of the heavy winter storm runoff from the lands, we knew that a large portion of the scanty rainfall was lost immediately from the area where it fell.

Measures had been taken to make use of surface waters in streams for irrigation, and of spring waters for water supply. I investigated their interesting "chain wells" for bringing down water underground to the plains by gravity without evaporation. I found no evidence to indicate that measures had been taken in the past to store and conserve rain and flood waters.

Fortunately, measures and practices of land use which conserve water at the same time control and retard erosion. Some problems of soil conservation fall outside this simple statement, but it is safe to say that water conservation would have solved ninety percent of the soil and water conservation problems in Cyprus. They needed to make a thorough land classification study so that lands would be used for their best purposes, which was not often done.

But of course, all problems cannot be solved technically in a land like the Middle East, or Cyprus. The attitude of the farmer also determines the fate of his lands. Ignorance of natural processes is one of the chief reasons for his failure to solve readily more of his land use problems. For instance, one of our party asked a farmer a question. The farmer replied, "If it rains at the right time, I get eight kilos of wheat off a dunnam (one-fourth acre). If it does not rain, I may get one kilo. It depends on God."

I found the Moslem reply to any failure on the part of the farmer to take responsibility to check erosion was, "Allah wills

WCL: whatever happens." So such tillers of soil do not take responsibility to safeguard their lands from floods or erosion.

Another problem in Cyprus had to do with the small parcels into which lands were divided. This prevented farmers from taking steps for erosion control measures. An additional disaster for the land was the custom of permitting unlimited grazing by goats on all lands immediately after harvests. This left the land in an unfortunate condition when, after the long dry summer and fall, the rains began. Accelerated erosion was the inevitable result.

Population was increasing and more and more villages were demanding of the government that they release more government-protected land for cultivation.

Returning to the United States

Chall: Were you able to complete your survey as planned?

WCL: Almost, for just as I had practically finished this seventeen-month survey in fourteen different nations, the war, of which we had seen a dress rehearsal in Belgium and France before the Munich crisis, suddenly burst upon the world.

My trip through Turkey was cancelled. Most travelers were frantic to get immediate sailings. We preferred to stay out of the rush, but we sent our children home for the opening of school; and then my wife, my secretary, Cleveland McKnight, and I took a pension in the cool of the Lebanon mountains, and remained to write up reports and at least partially digest some of the many things we had seen and done.

Chall: Had you kept a detailed record of each day's activities?

WCL: Yes, and afterward it made interesting reading, at least to those of us who experienced it. We found we had traveled more than 37,000 miles by car and local government planes over certain areas. We traveled over some of the world's worst roads and tracks, sometimes ten to fifteen hours daily in the car. We slept in 148 different beds of every description.

We met with more than 120 scientists, agriculturalists, archaeologists and government officials for one to several conferences each, and carried on a correspondence of five hundred

WCL: letters in connection with the survey. We examined and made special studies in 124 different areas in the fourteen separate countries. I took more than one hundred soil samples, took 3,500 still pictures and three thousand feet of movie film. I gave seven public addresses and one radio talk and wrote twenty-six special articles on various aspects of our studies, most of which were published.

Chall: That is a remarkable record. How could you accomplish so much?

WCL: Well, we never took time off. We were at work all the time. As Milton Eisenhower remarked after I returned and he saw my reports and mounted, tabulated pictures, "You look well, so I know that you ate, but I do not see how you ever had time to sleep."

We maintained this terrific pace because countries who planned our trip set up schedules and we tried to meet what they planned for us. Each country was so challenging, I wanted to see more and more. But it was an exhausting pace with no vacation at all anywhere.

Chall: Did the enlarging war make it difficult to get passage home?

WCL: No, for we had given all others a chance to go first, but we were certainly in a mess with our car. The French were commandeering all cars so no one would buy ours. Boats were overloaded with cargo and refused to accept our car. Actually it would have been just as cheap, or as big a personal loss to us, just to give it away.

I used all the diplomatic pressure I could and got agreement to have it shipped, but only if it were crated in a solid wooden box. This was an almost impossible thing to get done. Lumber was scarce and excessively high. But finally, on October 8, 1939, we boarded the United States Excambion with all our possessions, masses of accumulated literature and with all reports completed. We had hoped now at last for a breathing spell, but it was a stormy cold voyage and my wife is the world's worst sailor, and in those days, no sea-sick remedies had been discovered.

After about twenty-five days on this combined passenger and cargo boat, we landed in New York on a cold November morning. What a relief we felt to be back again in our own wonderful country!

TRAVELS ABROAD WHILE ASSISTANT CHIEF OF THE SOIL CONSERVATION SERVICE

Part I Land Use Survey of Europe and the Middle East, 1938-1939

[Taped questions and answers]

Surveys of Old Lands Seen as a Challenge

Chall: I thought today we could talk about how you felt about leaving Washington for this land use survey of old countries. Did you feel it was a challenge?

WCL: Most assuredly; I felt it was a challenge and also an honor. I hope you will read the project.*

Chall: Yes, I did. It's amazing.

WCL: You can see we had an ambitious program. Also we hoped that contacts we established would be continued so as to benefit from the experience of Europe in land use. It was a challenge to travel and read the story that has been engraved in the land and what man has done to it.

If one looks at land from the point of view of growing foodstuffs for rapidly increasing mankind, it becomes a problem of the highest importance. So to be on the front line of this kind of exploration was to me quite an exciting thing. For me, it began in China and I'm still on that trail and will be as long as I live.

Chall: Yes. Did you have the feeling that you were being pushed out?

WCL: No, because we'd built up a fine esprit de corps. We pioneers in conservation were a group of people who had this opportunity to develop not only a science, but a technology in the use of land and the improvement of its production, and in safeguarding the land.

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*Ibid, pp. I-II.

WCL: I cherish my experience in the Forest Service where our esprit de corps was so fine. I was working to develop that kind of esprit de corps in our Soil Conservation Service as well, so that we would collaborate with each other instead of trying to knock others down. That was my point of view; if one had an assistant and he was left in charge, he would be loyal to you while carrying out his work.

Chall: Did you feel at this time, in 1938, that you had achieved this fine spirit and so it was all right for you to go away, for the work would be carried on?

WCL: The suggestion that we make this kind of survey was done by the Appropriations Committee of Congress, when we first gave them an accounting of money spent in the past year, and we also set forth a program of works and expenditures for the coming year.

We presented to the Appropriations Committee a really tragic story, of how in a comparatively short time in the United States, we had destroyed so much land and brought about destruction through our mismanagement and wasteful exploitation. This was important not only now but for the future. This was a challenge not only to farmers, but to lawmakers and all people interested in the welfare of the nation.

Clarence Cannon's Interest in Land Use Survey

Chall: Do you remember any particular people on the Appropriations Committee who conceived the idea of going to study old lands? This was a new and interesting idea.

WCL: I think it was representative Cannon, for he was the chairman of the subcommittee on Appropriations. He was very interested in nurseries in Missouri. I had developed in our Division of Research what we call hillside farming, for one of our big problems is how to establish permanent agriculture on sloping lands. We wanted to develop specialty crops we could grow on steep slopes, that would have some special use and value and introduce new species.

I think I won Representative Cannon over to our side by a unique experiment I tried. We were asking for a fifty thousand dollar appropriation for this work. We had found what is called the shipmast locust tree, so named because a sea captain in early colonial days had lost his mast and sent some of his men ashore

WCL: to find a suitable tree for a mast. They found that this locust tree was straight and strong. These trees were also very resistant to rot.

So I got a black locust fence post that had been in the ground for more than one hundred years and had not rotted. I brought it to the hearings and said, "Here, this is a one hundred year old fence post."

This greatly interested Representative Cannon and instead of giving us a fifty thousand dollar appropriation for our plant introduction work, he gave us one hundred thousand dollars--just double what we had asked for, which was unheard of. From then on, Cannon was most helpful to us and strong for our introduction nurseries.

I am quite sure that Cannon, chairman of the subcommittee, was the one who favored my land use survey. He wanted us to keep going on our program until our work was organized so that we could be released for this special assignment. Then it was his suggestion that we should make a study of how older countries had been using lands a thousand years or more and what they had done to them or for them, especially regarding the erosion problem. We were alarmed because we had found so much destruction in our short existence here in the United States.

Thoughts on Dr. Lowdermilk's Appointment

Chall: How did it come about that you were the one chosen to make this study?

WCL: Well, I had made my surveys in China, including a special study of the problem of erosion on a tremendous scale and was deeply concerned with the problem. Also, I had written articles and showed astounding pictures of what uncontrolled erosion could do to a landscape over long periods of time. So my studies in China were a background for a study in Europe and the old lands of the Near East. So this opportunity was a great challenge to me to keep on with my study of the relation of mankind to erosion, and ways and means of keeping it under control while we cultivate the land for food crops and other useful things.

Being able to speak French and German fluently was also considered to be an advantage, and I certainly found it so. My selection for this land use survey was done at a higher level than

WCL: Bennett. It was done by Secretary Wallace of the Department of Agriculture.

Chall: You wrote long letters to Bennett, describing your findings.* Once in a while you asked for information about what was going on in the Soil Conservation Service. You seemed to feel occasionally that you weren't getting news from home. Were you apprehensive when you asked questions about the Soil Conservation Service and they were not answered?

WCL: I thought this was curious. But actually, we had so much to do and we were so busy, I didn't let it bother me. It wasn't until towards the end that I realized, when some of my friends gave me clues, that something was crooked. But I don't know that it will advance soil conservation very much by emphasizing this.

Chall: Well, you might not advance soil conservation, but you will help the writing of history of the administration and politics perhaps.

Attitudes of Europeans Toward Impending War

WCL: You asked some questions about the attitude toward the war by technical people with whom we were in contact along the way. The scientific and especially agricultural people were dealing with earth processes, and even in times that were rather ominous we could keep to our subject.

I didn't want in any way to appear to be partisan, because I didn't know the situation. However, I'll tell of one insight I had in Holland. Of course, the Zuider Zee Project was one of the outstanding achievements of mankind, in development and reclamation of lands.

I was on a field trip with some of the staff on this Zuider Zee program and they took me into a glass house for refreshment. On the inside were grapevines; they were about a foot apart and had been trained up and then across the ceiling, and from these grapevines hung great bunches of luscious black grapes. This was Holland's method of production because the climate is cold.

Then we were served yogurt and a jam-like sweet that went with it. I said, "This is marvelous. This yogurt would compete

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*Ibid.

WCL: with ice cream in the United States," and we talked about it.

The next day one of these young men at lunch said, "You'll be surprised, but last night I didn't sleep any because I was thinking about your suggestion of yogurt." Then he outlined his idea. He wanted me to take part in a company that would develop yogurt to sell to the United States.

Yogurt wasn't a common food in the United States at that time. They would produce the product, and I would be supposed to prepare the sales. If I had followed their plan, I'd probably be a rich man. [laughter]

Chall: Yes. You would have been a pioneer in bringing yogurt into the United States.

WCL: This man said that one reason for the project was that this would enable him to get to the United States. They wanted to escape this impending war crisis. This showed me their own attitudes and fears and their hopes.

Then they told me that in Holland they were producing about fifty thousand more farmers a year than they could use. They were migrating. I expressed disappointment they weren't coming to the United States, such good and capable people.

Chall: Where were the farmers going?

WCL: They were migrating to Canada, to Australia, and some to South America. It was most difficult to get into the United States.

Dr. Lowdermilk Analyzes the Munich Pact and Other Problems of the Survey

Chall: You wrote letters back that indicated you were aware of the war problems and of the Munich Pact.

WCL: Oh yes. We were in Paris and saw Daladier come back, and then we joined the crowds when he went to the Arc de Triomphe and stirred the Eternal Flame that is a symbol of relationship to the past with the solidarity and hopes of the future.

I was very concerned about the sell out at Munich, because it was obviously such a raw deal that one would have to take a

WCL: stand. I referred to it before, that Chamberlain said he came back with "peace with honor in our time," but I said that instead of peace with honor, he'd brought back honor in pieces. But I ran into trouble with our state department on this.

Chall: How did you do that?

WCL: Well, they wondered who is this person who is an agriculturalist having such definite opinions on political matters of this kind? My statement had been printed in my mimeographed letters,* which were popular all over the United States. But before reprinting, they wanted to eliminate my statement about "honor in pieces." I said, "No. That's what I felt at the time, and that's what I want to be on the record." So they didn't reprint the bulletin.

Chall: When you came into a country, where did you have your papers cleared?

WCL: I usually went to the capital first, and reported to our embassy so they would know who we were and what our project was. Of course, we had sent ahead the prospectus for the project. Usually we got excellent cooperation from all officials.

For instance, Mallory was the agricultural attaché for France. He gave me an office so I had a place to work. He was skeptical of our American foreign policies and what was going to happen. He didn't think we were doing all that we could do.

Mallory was also a little skeptical of why we should be making this survey at this time. Because local people were so occupied with their national problems, it interfered some with our conferences in the field. There was quite a cleavage between agricultural people and diplomatic people.

When state department officials turned us over to the agricultural people, we were in their hands all the way through. We took care of technical matters; then often these agricultural men discussed with me their personal and national problems.

Traveling With the Family

Chall: Before we get too far into the discussion of this trip, I'd like

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*Ibid.

Chall: you to tell me how you managed to combine your busy survey activities and your family life.

WCL: We had an organization. Everyone in the party had something to do. My fourteen-year-old son was in charge of packing the car. We found that things had to be placed just so, or we could not get them all in. We had shipped our Buick but they were smaller then.

In North Africa the French were so interested in what we were doing, they sometimes sent one of their top hydraulic or soils men along with me in our car. It was a new 1938 Buick with two spare tires in pockets on each side and was one of the best cars the Buick people ever built. We had no trouble whatever during about 26,000 miles. It stood up marvelously to long hours and strenuous field trips.

I did all the driving and took good care of the engine. Also, I gave a lot of dictation to my secretary, Cleveland McKnight, while in the car, and then at our next stop, he would write them up for my files.

My wife was also very helpful; she would write up notes and impressions of each country and its people. She has always been interested in people and this was very helpful. She takes history very seriously and was always talking about the rise and fall of civilizations in these old lands, and especially pondered that these prosperous Roman lands and populous cities and strong fortresses could fall, as the leaves in autumn, never to rise again.

During the long hours of desert travel, my wife had our son and daughter memorize many of the finest poems of our great poets which she had memorized and retained since her school days. I never knew anyone who had stored away so many literary treasures. She could literally recite poems or chapters in the Bible by the hour.

Chall: What about your daughter? You have not given her a role yet.

WCL: She was ten years old, but she was adept at learning to read the landscape and what had happened to the land. This must have made a deep impression, for years later, she chose geography as her major for her university degree.

However, she was little and she was lonely among adults, so when she saw in Algiers an adorable little Bedouin puppy, shivering and cold, for sale on the street, she begged so hard for it that we succumbed. He traveled on our laps for six thousand miles in the car, stayed in the best hotels and had food from our plates. Surely, no Bedouin dog ever lived such a life of luxury and love.

WCL: He entertained us countless hours of travel in often dreary landscapes with his cute puppy ways.

Chall: Then you enjoyed having your family along with you?

WCL: Well, this way we were not separated, and it was the chance of a lifetime for my wife and the children to travel. Of course, travel would be some risk and some thought we should not take the children out of school, but they both benefited so much, they each skipped a grade and both children had many subjects for their papers in composition.

We had no accidents or real problems so it was better not to be separated for this year and a half. All the family adjusted well to travel and there were few complaints, except our boy repeatedly said he would rather stay home so he could play ball.

Mr. McKnight: From Secretary to Attaché

Chall: Did your secretary, Cleveland McKnight, have other training?

WCL: During the depression, he was studying at a southern university but family resources required that he stop and support himself, so he took up stenography as a secretary. When I sent out a call to our Service for a man secretary to go on this trip, I got quite a number of applications. I chose Cleveland McKnight and he was excellent. He was diplomatic and had charming southern ways.

But your other question: what became of him?

After traveling with me abroad and in the United States on speaking tours, he had become quite an authority on agriculture. He had met with consular and state department officers and agricultural attachés in each country. He came to the conclusion he could do as well or better than those he had met.

When he was released to go back to the Service, he applied to the state department for a job as agricultural attaché. He was not trained in agriculture, but when he sent in his qualifications--that he'd been with me as my secretary for two and a half years altogether, looking into the use of land abroad and at home--they said, "Well, that's equal to a college education," and accepted him. I was delighted that our association had given him

WCL: that standing.

He did very well in the state department as an agricultural attaché for a number of years. And then poor Mac died of a heart attack.

Chall: On your overseas travels, how did you find places to stay?

WCL: Usually by our previous contacts by letter or by friends. For instance, in Paris one of the top men on the embassy staff had been a student at the University of Arizona when I was. He gave us the name of a charming hotel over by the Chambre des Deputées that was near Daladier's house on the Place de la Concorde. So we had a very nice and reasonable place for our party. Many times later when in Paris, we returned to this hotel. From time to time, officials directed us to their favotite places and often our government contacts arranged housing for us, except in the night to night stops when traveling.

Land Use Practices in Italy

Chall: You have written much about your land surveys in France and Italy, but you mentioned you saw some land practices in Italy that you felt were harmful to the land. What were they?

WCL: As we were driving down from France to Rome, we saw large areas of land that very evidently had not been cultivated for centuries. They were being broken up into farms for the first time. I understand these lands were the estates of rich landlords.

Now Mussolini had forced these landlords to divide up portions of their great estates as homes for peasant farmers. This would have been such a wonderful time to divide the land and lay out fields for conservation measures that would control erosion, for there were no boundaries or buildings or obstructions or fragmented land that later would make proper layout difficult.

But the Italians were plowing up and down the slopes and nothing was being put in on the contour. Italy had little power machinery at that time, and this work was all being done with their huge, long-horned cattle pulling the plows, while all else was hand labor.

This lack of foresight was hard for a land conservationist to take. I couldn't do anything about this, because unless

WCL: we had some connection with the men in charge of this work, we could not go out to the overseers and suggest that certain things should be done. Yet what they were doing would in time ruin the land.

I found, generally, that when [Italian] officials were talking to farmers, they took an attitude of knowing it all, and taking for granted that the farmer knew practically nothing.

Chall: You found this attitude all over the world wherever you traveled, isn't that right?

WCL: Practically all over the world. That's one reason why I championed the cause of the farmer.

British Mandate, American and Jewish Agency Officials in Palestine

Chall: I'd like to talk with you about some things arising out of your experience in Palestine and the Near East. How about the relationship between the British Mandate and the United States diplomatic people in Palestine in 1939, and between these officials and the Jewish Agency?

WCL: Well, I don't remember much of it, for more than twenty-eight years have passed. I had a lot to do with Amihud Goor. He was attached to the Mandate government as Deputy Director of Forestry at the time of the breakup of the Mandate. He told me the British, at the last, gathered all heads of departments--which included Amihud Goor but they overlooked the fact that he was Jewish. They instructed these heads of departments to create confusion so that the Jews would have great difficulty in taking over the management of the Mandate. The United Nations had commanded the British to leave because they had failed to live up to their Mandate.

Actually, I got a lot of inside information from such men as Amihud, and Assaf Goor, Mr. Reifenberg, P. L. O. Guy and others, who, though they worked for the British Mandate, were entirely sympathetic to the Jewish national home established by the League of Nations.

But all the Americans, including the Y.M.C.A., were entirely sympathetic with the British viewpoint and administration, and very critical of the Jews and all they were trying to do. They did not approve of such rapid progress and energetic reclamation

WCL: but wanted Palestine to remain as they imagined it was in Bible times.

Amihud Goor translated my book, Palestine, Land of Promise, into Hebrew, at a time when it was not popular with the British to have anything published that was favorable to the Jews.

Chall: Publication of your book must have created quite a sensation in Palestine at the time among the Jews.

WCL: Many refer to it as giving them hope at one of the darkest periods. When this book came out in New York, Mr. Agron, editor of the Jerusalem Post, said, "This must go to England." He got ten copies and took them with him by plane. Several leading Jews, including Burl Locker, then head of the Jewish Agency, sat up all night reading it. It made them hopeful and gave them courage.

It made quite a sensation there. They published a smaller-type English edition. My book was eventually translated into seven different languages and about fourteen editions in the United States. It went over a great deal of the world. It never bothered me that henceforth both the British and the Arabs called me "that damned Lowdermilk."

Chall: What about the Jewish Agency during the Mandate?

WCL: The Jewish Agency set up its organization because they wanted to represent not only the Jews of Palestine, but also Jews throughout the world. They also had some soils men and some agriculturalists--that's where Volcani did such good work.

The Mandate did not concern itself much but let the Arabs go ahead farming as they had been with their low yields. But the Jewish Agency was aggressive and attacked the problem of big yields to support larger populations. They were also aggressive in their research, their testing, their application of fertilizers and improvement of seeds or importation of better strains. They worked on an entirely different basis than the Mandate.

Planting Forests

Chall: Could the Jewish Agency push the Mandate officials to do more in terms of replanting trees or improving agriculture?

WCL: I don't know just what the relationships were here. Amihud Goor was a specialist in forestry, and whenever he saw vacant land, he wanted to plant a tree. I had a battle with the Jewish National Fund over that. I once objected very strongly. I was,

WCL: of course, called in as a consultant.

The Jewish Agency and the Jewish National Fund wanted to plant trees, but my attitude was that land should be used only for its best uses. If land could grow grasses, then it should be used for pasture. If land could be terraced for orchards or vines, then it should be developed for this purpose. Trees should only be planted on rough ground unsuited for growing crops. Trees are a long-time project, whereas many other uses give a quick response in production of foods.

For instance, there was a Kibbutz near Ein Hod, the artists' village, where there was rolling land, ideal for pasture for their dairy cattle. They needed this pasture land to make their dairy enterprise a success. But the JNF thought this was a good place to plant trees. So they objected that I objected. [laughter]

Agriculture

Chall: You mentioned Mr. Volcani, who was an authority on Arab agriculture.

WCL: Yes, he took his job very seriously. He studied how to build up the agriculture of the new Jewish state. He wanted to learn all he could from Arab farmers who had been farming this land for centuries: what crops did they grow, how did they grow them, whether or how they fertilized their land, and the like.

For instance, the Arabs didn't have much of an idea of fertilizer, or its uses. They allowed manure to pile up around their houses. But when the Israelis came, they bought this manure from the Arabs, spread it on their fields, and greatly increased their harvests. In some cases the Arabs used fertilizer for fuel.

But the Arabs did have a certain amount of traditional knowledge in selection of strains and crosses for summer crops and winter crops depending on moisture. We must remember that Jews for centuries had not been permitted to be farmers so they were eager to learn locally and from abroad all they could.

So Volcani, and some others, wanted to understand why Arab farmers got such low yields, and what could be done to increase them. This was a method of building on what had been done in the past. But of course, this was way back in the beginning. Now, Israel is the success story of all the emerging nations.

Judah Magnes

Chall: We've talked about some of the scientists in Palestine, but not about other people of prominence. Did you meet Judah Magnes while you were there?

WCL: Yes. When I spoke at the Hebrew University on Mr. Scopus in '39, he was chairman of the session. Also I had a few conferences with him at different times. He was a controversial figure even then in his position of wanting mutual collaboration with the Arabs. But he was a very learned man, and a great spirit. The people I worked with were generally not of his same persuasion, but his position was that of a great man with a profound faith in peoples.

Arab Scientists

Chall: Did you meet many Arab scientists on this 1939 trip?

WCL: No, very few. But Mr. Radi, of Iraq, who was a graduate of the University of California at Davis, was an outstanding exception. He was married to a beautiful Arab girl, graduated from Beirut University. We had a delightful dinner in their home. Ordinarily, Moslem men and women never eat together, as I told you when my wife had to stay home from King Ghazi's dinner because whe was a woman. But because they were both college-trained we could sit at the same table and eat together.

He was director of a large Experiment Station near Baghdad. He found it difficult to deal with the backward farmers of Iraq. Even he, with western training, could not or did not get over the usual short-sightedness of the people.

We found Mr. and Mrs. Radi very interesting and kept up a correspondence for some years. On their honeymoon they went to the Arctic Circle--quite a contrast to the hot Tigris-Euphrates Valley. I was sorry he gave up the Agricultural Experiment Station and went into diplomatic work, for although Iraq is the greatest unused and undeveloped breadbasket in the world, yet its farming methods are primitive, the yields are low and the sparse population are pathetic. Even now, in 1968, the average income per capita is only $193 in spite of oil royalties.

Understanding Erosion in Europe and the Middle East

Chall: Dr. Lowdermilk, your special concern in making this interesting survey of old lands was with the development of a permanent agriculture on sloping lands--and with the menace of erosion. Were the people in Europe, North Africa and the Middle East as concerned or knowledgeable about erosion as you?

WCL: No, we found no one interested until we reached Palestine. P. L. O. Guy was tremendously interested in this problem of erosion in Israel which I have told about elsewhere. His measurements of erosion showed that at least three feet or more of soil had been washed off to bed rock over all the hills and mountains of Judea and Galilee. Also I found Sir Flinders Petrie tremendously interested in agricultural archaeology.

This subject has always intrigued me and I had hoped we three could follow along with it, but Sir Flinders was a very old man and P. L. O. Guy died shortly and I have never found any one else interested enough to carry on this study with me.

To many, erosion was practically a new subject. Even many experiment stations were not taking erosion into consideration on their research plots. I generally had to explain what I was talking about. Some of the experiment stations were doing fine work and testing fertilizers and seeds and the like, but at the same time, were allowing erosion to decrease the productivity of the plot. I found no research studies anywhere to measure amounts of erosion.

When I got out in the field with farmers and officials, even though it had a lot of gullies, somehow they accepted them as part of the natural landscape.

Chall: Even though in some areas they were fighting the gullies?

WCL: Yes. For instance, Dr. Ross was the Director of the Union of South Africa Soil Conservation Service. He was deeply concerned with the gullies, called "Dongas," and was planting trees in the bottoms. This was the best they had been able to do and to get the Afrikan farmers to carry out. The agronomists were not as active about this as were the foresters.

On the other hand, the English climate is mild, the rainfall is misty and there is very little storm runoff, so there's practically no erosion. So even at the famous Broadbalk experiments at Rothamsted, which is over a hundred years old, they were primarily fertilizer experiments. These experimental plots were plowed up and down a slight long slope. The furrows were one to

WCL: two hundred yards long. To set up an experiment to run more than a hundred years in that manner would be inviting disaster for us.

England does not have a serious erosion problem. When I asked them if they were carrying on research in erosion, they said no, they didn't have any. So I used Great Britain as an example to show that in England, erosion was little or no menace to them.

Then we have comparisons of our own measurements here in the United States, where rains are heavy and storm runoff is excessive and cuts into the soil in rills and gullies to carry it away. This contrast was impressive and instructive.

Developing Ideas About Agricultural Archaeology

WCL: Often we had to set up a terminology that would fit these new concepts of erosion and what it does to the land. That was the reason I created the term Agricultural Archaeology. I talked over these ideas at great length, as I have told you, with all the outstanding archaeologists of Israel and with some of the French in North Africa.

When I returned to the States, Dr. Wilson, Chief of the School of Oriental Studies at the University of Chicago and who was the successor of the famous author, Breasted, contacted me. He asked for a conference and we discussed the subject at length, and then he asked me to talk to his staff at the University of Chicago. I entitled my talk, "Criteria of Agricultural Archaeology."

But we were working toward giving close attention to the record of what happens to soil under use for a long period of time and under what conditions. In other words, we brought up the problem of a permanent agriculture: How does one know whether farming the country at the present time will provide permanent use of the land? Will the land last that long? We got into some very significant, fundamental problems.

You see, most of our agricultural people deal in a very narrow length of time, usually, the crop season. Two or three years is about the outside limit. Rotation, for instance, may be five years or so. But oftentimes these processes of erosion and wastage do not work fast enough to show up very much in five years. But in fifty years or five hundred years, they can change the whole shape of the land, its topography and its drainage.

Nelson Glueck

Chall: You saw very concrete evidences of this in the Middle East. Did Dr. Glueck, who was working on the excavations, see these possibilities?

WCL: Oh yes. He was all for it. One reason why it was not possible to work out with Nelson Glueck the plan that we were working on with P.L.O. Guy was that he was chief Rabbi of Reformed Judaism, and he was very busy. He now lived in Cincinnati, and only made short trips to Israel. We first discussed this when he was director of American Oriental studies in the old city of Jerusalem, when we lived for some months in this compound.

Glueck was the one who discovered the Nabateans, explained their civilization and various activities, their pottery and inscriptions, their writings, and so on. He was very much interested, but he couldn't give time to this study, along with his pastoral studies. But I have never found a younger man free and interested to take up this study which has so greatly interested me.

Yigael Yadin

Chall: What about the archaeologists in Israel? Did you talk over your ideas with any of the young aspiring archaeologists in Israel?

WCL: Yes. I talked it over both with the young ones and the old ones, including the famous archaeologist, Yadin. I had been with him three different times in the Huleh, where he was excavating Hatzoa, the stronghold where the forty kings joined together to defend themselves against Joshua and where he defeated them. All were very keen about my interest in agricultural archaeology and eagerly discussed it with me.

Chall: Even if you didn't develop a new field, it made them more aware of what they were seeing at the dig.

WCL: Of course. You remember, my stock question to archaeologists was, "What was the agriculture which supported the people of this town, these ruins you are excavating?"

Chall: That's a pertinent question.

WCL: We went with Reisner to the great pyramid at Giza, but he was not interested in the idea of agricultural archaeology. I was very much disappointed; he dismissed the interview.

WCL: When I got to Jerusalem, that was one of my first questions to Dr. Nelson Glueck. The moment I mentioned this, he suggested many questions that had been arising in his mind. He was enthusiastic in taking an interest in all I had to say.

P. L. O. Guy

WCL: I have mentioned before P. L. O. Guy, a colonel and a Scotchman, married to the daughter of Yehuda, the great linguist who caused Hebrew to become a living language again in Israel. When the British left Palestine after the Mandate was over, he stayed behind, and the government of Israel made him director of the Archaeological Survey. As I mentioned earlier, he worked closely with me on plans for agricultural archaeology.

Sir Flinders Petrie

WCL: Also, I often discussed this idea with Sir Flinders Petrie, who was dean of the archaeologists, and one of the first to develop scientific archaeology. He stands as a bright light in this field of inquiry. When I mentioned my ideas to him, I thought he was going to hug me. Here was a long-lost brother. He said, "We must talk about some problems I have," and we would talk for hours.

He was a great inspiration, a wonderful man and a thorough scientist. His questions were plain: What happened to fields when plowed and water ran off of them? What became of the water? What became of the soil that was moved? and the like.

All these details he thought about as he was working in very minute detail on his digs or excavations. They wanted to find the artifacts in place, then carefully brush them off with a camel's-hair brush to be sure they didn't break or destroy the artifact.

His wife, Lady Petrie, concerned herself with raising funds to continue the digs by Sir Flinders Petrie. They were now quite old and his working days were about over, but he had a keen memory and a clear mind, and a tremendous interest in all phases of archaeology.

Chall: Had he been working in that area for many years?

WCL: Yes. He started in Egypt where they found a library, or archives,

WCL: of El Marna letters, which were carved on clay . . . cuneiforms. In the early times there was an Egyptian who had conquered much of the old world. These Marna letters were reports from his men who commanded different districts. Sir Flinders was one of the primary early workers on these famous ancient records.

C. S. Jarvis

WCL: Then there was Major Jarvis who was Governor of Sinai. He was especially interested in restoring some of the productivity of ancient times. He got the Arab Sheik to clean out ancient cisterns and divert water into them for irrigation. It was Jarvis who said that Arabs should be called "Fathers of the Desert," instead of "Sons of the Desert," because wherever the Arabs had gone, they begot deserts.

Theories on the Devastation of Land: Climate versus Culture

Chall: Now, while we are on the subject of archaeology and your desire to know the land use practices of old civilizations and what reasons made them rise and fall, your studies had led you to the conclusion that climate was not responsible for the great devastation of land, but that the ruin could be blamed on wrong land use practices. Was this theory of yours acceptable among archaeologists like Sir Flinders Petrie and Dr. Harper and Dr. Glueck?

WCL: Well, on these men, yes, but on most others, no. Of course, all archaeologists recognize there has been a definite climatic change, but over a long geologic period as contrasted to changes within historical times within the memory of man.

When George Marsh was made ambassador to Italy by Abraham Lincoln, he had little to do and he devoted his time to travel and study of the old Roman Empire, its prosperity, its great armies, and its ruins of great cities in North Africa, largely covered with sand or with erosional debris. What had caused this transformation of former rich, populous and prosperous regions to desert-like conditions?

I was an avid reader of George Marsh's book, The Earth as Modified by Human Action. I was in agreement with his findings,

WCL: though then I had never been to North Africa. He was skeptical that there had been a change of climate since Roman times.

Of course, I had begun to think deeply on this subject of climatic change when in China, as I have told you, in contesting Ellsworth Huntington's theory that north China had become desiccated and largely depopulated due to an adverse change of climate and that there were pulsations of climate due to sun spots.

I felt I had refuted this conclusion when I found the temple forests in northwest China reproducing themselves naturally in the present climate and rainfall because they were protected from destruction of man and his herds by stone walls.

Then I began the scientific study of rainfall and erosion by scientifically measuring it on forest lands with litter and on adjoining lands that had been bared of vegetation and eroded. I found that erosion could destroy a region and depopulate the land without a change of climate.

One of the reasons I wanted to make the survey of old lands in the Mediterranean region was to see these Roman lands that I knew from history were productive, prosperous and populous. These lands I also found in the same general type of decay, with blowing sands and eroding gullies, as I had found in northwest China.

When the French took over Algeria and Tunisia and later Morocco as a protectorate, the French scientists were keen and thorough-going in their studies of what had happened to these fair lands and what could be done about them to bring back ancient prosperity.

In Algiers, I found Mr. Godet and Dr. Lesci, a French scientist and archaeologist, who told me of how when Scipio, a Roman general, in 146 B.C. destroyed Carthage, he first saved all the twenty-eight volumes of the famous Phoenician agricultural writer, Mago, who was the great authority of ancient times on agriculture of the Mediterranean world. These famous volumes on agriculture were probably placed in the library at Alexandria, Egypt, which was recognized as the greatest of the ancient world.

Mago's books, along with those of Columella, another authoritative writer on agriculture in Roman times whose writings read like a modern treatise, were destroyed when this greatest library of the ancient world, with its priceless heritage of authoritative ancient writings, was burned to the ground when the Moslems invaded North Africa in the seventh century. This was a great tragedy of the ancient world and also a loss to the world for all time.

French Scientists Study the History of Land Use

Chall: Did you discuss your ideas of whether there had been an adverse change of climate or not with these French officials, scientists and archaeologists?

WCL: Yes indeed. There were a number of French scientists who were making, or had made, thorough studies of the climate, the land and what changes had taken place. One of the leading ones was Stephane Gsell. He was a geologist to whom many writers referred. I was determined to locate his eight-volume collection of Histoire Ancienne de l'Afrique du Nord (History of North Africa). I found this most difficult for none were to be found in North Africa.

My wife had promised to give me Gsell's book for my up-coming birthday, not knowing that it was eight volumes. Finally, a scientific friend in Grenoble, director of Neyrpic, Dr. Pierre Danel, who had offices in Europe and North Africa, found and mailed me a set, and sent a bill for forty-eight dollars to my wife. This was quite a stunning blow, for she does not even read French as I do, so she was not very happy with my gift or the price, except that it gave me personal satisfaction to have the set.

Lesci and Godet showed me numbers of olive presses in barren treeless areas that evidently had produced much oil for Rome. Also they had found countless stone wine presses scattered about in areas devoid of any grape vines. The French said, "If in ancient times, certain areas produced quantities of olives for oil and grapes for wines to be shipped to Rome, then if there has been no adverse change of climate since Roman times, olives and grapes will grow today."

They began to put in pilot plantations, and because these were successful large areas were planted up. Indeed, I saw them growing successfully, showing that in the present climate and rainfall, they grew in North Africa today as they did in Roman times.

The French scientists and agricultural men took me to see all the beautiful old Roman cities I have described before. First Director Godet showed me his experiment in growing olives and vines at Timgad, the great excavated city founded by Trajan, where he had been experimenting for fifteen years and found that olives grew today as of old when Timgad exported oil to Rome. Different archaeologists and agricultural men took me to El Djem, Sbeita, Djemelia, Idress, and other ruins.

I spent some time with Gautier, a very keen geographer, and his son, who was a brilliant geologist, both of whom had done splendid work in North Africa. When in Paris, I was delighted to consult with the senior Gautier who had spent many years in

rares en cette saison. Une remarque de Frontin mérite d'être citée : « En Italie et dans quelques provinces, vous causez un grave préjudice à votre voisin si vous faites pénétrer l'eau dans sa propriété; en Afrique, si vous empêchez l'eau de passer chez lui[1]. »

Les textes que nous venons d'étudier manquent souvent de précision; ils ne doivent pas être tous accueillis avec une confiance aveugle. Ils permettent cependant quelques conclusions.

Au Sud de la Berbérie, le Sahara était déjà un désert dans les siècles qui précédèrent et suivirent l'ère chrétienne. Mais il était peut-être un peu moins sec que de nos jours.

Il est inexact de dire que, pendant une partie de l'époque historique, la lisière septentrionale du Sahara ait été une zone humide. On a cependant quelques raisons de supposer que les montagnes qui bordent le désert recevaient un peu plus de pluie qu'aujourd'hui.

Quant à l'Afrique du Nord proprement dite, elle jouissait d'un climat, sinon semblable, du moins très analogue au climat actuel : sécheresse habituelle en été, sécheresse parfois pendant toute l'année, pluies irrégulières et souvent torrentielles, bien moins abondantes, d'une manière générale, à l'intérieur du pays que dans le voisinage de l'Océan et de la Méditerranée depuis le détroit de Gibraltar jusqu'au cap Bon. Que cette contrée ait été un peu plus humide qu'aujourd'hui, cela est possible : à défaut de preuves, on peut invoquer quelques indices, qui ne sont pas dénués de valeur. Mais, en somme, si le climat de la Berbérie s'est modifié depuis l'époque romaine, ce n'a été que dans une très faible mesure.

1. De controversis agrorum, dans *Gromatici veteres*, p. 57 : « In Italia aut quibusdam provinciis non exigua est iniuria si in alienum agrum aquam immittas; in provincia autem Africa, si transire non patiaris. » Conf. Agennius Urbicus, *ibid.*, p. 88. Frontin dit encore (*l. c.*, p. 36) : « Cum sit regio aridissima (il s'agit de l'Afrique), nihil magis in querela habent quam si quis inhibuerit aquam pluviam in suum influere; nam et aggeres faciunt et excipiunt et continent eam, ut ibi potius consumatur quam effluat. »

From Stéphane Gsell, Histoire Ancienne de L'Afrique du Nord (Paris, 1913), Volume I, p. 99.

WCL: studies in North Africa. He was on leave in Paris from his work as Professor in the French University of Algiers. He had written a number of books on Magreb, which is a name for North Africa in ancient times. The soils man who had been traveling with me made arrangements for the conference.

Gautier received me very cordially and we had a long discussion on his writings and his conclusions. I asked him point blank, "What is your view as to the change of climate since Roman times?" Then he said in French, "Mais, les peuple ont changés." (The people have changed.) That was very penetrating. As far as I was concerned, this explained the whole situation.

Berbers

Chall: Had all the people changed with the Mohammedan invasion during the seventh century?

WCL: Well, very many of the ancient populations were killed or were converted to Mohammedanism by the sword. All but the Berbers, a people who have lived in the mountainous regions since the stone age. They have never been defeated or driven out by any conqueror. The Moslems were driving on toward Spain but were defeated and established themselves in North Africa. They gained control over the Berbers and became known as the Moors. The more advanced culture of the Moorish period came from these excellent qualities of the Berbers.

Incidentally, I have a high respect for the Berbers. They're a splendid people; they're a pragmatic people. They are skillful with their fingers and they make good machinists and work with tools in a splendid way. And that's why the French depended so much on the native people of North Africa to man their machines and tools.

Jewish Settlements

WCL: But to get back to the subject of climate--one of the reasons I was especially interested in the Jewish agricultural settlements was because they were taking what I called a man-made desert and bringing back a modern agriculture. These areas responded to intelligent management and reclamation and indicated that climate had nothing to do with the deplorable condition of the land as they found it at the beginning of this century, but that man's use and mis-use had brought about this adverse change. They

WCL: demonstrated that modern techniques and love of the land caused it to respond accordingly with bountiful harvests.

Chall: So the Jewish colonists also proved there had been no adverse change of climate since Roman times?

WCL: Yes indeed, and they had some of the best students of archaeology and history to be found anywhere. These men discovered that ground water was at about the same level as it had been in the past. Apertures in cisterns and springs that were constructed in ancient times were considered correct for modern times.

But I wanted to see for myself, so they took me to a spring at Jerash, in Transjordan, which was constructive evidence. The outlet was protected by masonry so that the water would be diverted into the canal to supply this ancient city with water. The level of the water and the opening for discharge of the spring appeared to be the same as when the Romans built it. There is no evidence at this spring of any change in the discharge since ancient times.

Frederick Clements

Chall: Did you discuss your theories on climate with scientists?

WCL: Yes, I remember talking with Frederick Clements. He was a remarkable man and also he was a genius, a scientific prima donna, and was very intolerant of stupidity, with no use for anybody who didn't think thoroughly and profoundly about scientific questions.

He was the man who developed our science of plant succession. Clements needed terminology. Plant succession was a new science with new concepts. He couldn't find in the English language adequate terms, or English words that would be satisfactory because we have other meanings we would associate with them.

So he decided to use the Greek language as a source of his terms. He learned Greek so he would have words for the new terminology that he wanted. He really went a little too far with it, for sometimes his treatises would be like reading a foreign language.

Chall: That would make it necessary for everyone to read Greek?

WCL: Exactly. I found that Clements was interested in climate and we usually had a lively discussion on it.

Controlling Climate

WCL: The old concept was that climate occurred in cycles. Bruner's cycle claimed that at the end of thirty-five years there would be a change of climate. The theory of climate occurring in cycles is not now accepted. We know we have periods of higher rainfall and periods of lower rainfall, which are not predictable.

I have wondered if in the future we might develop some device to modify or enlarge existing storm tracts so we could bring down on earth a greater amount of rain. Of course, that would be dangerous until we are better prepared to make use of the excessive rain we might get.

Chall: So we'll have to have a highly developed scientific community before we tamper with the skies.

Comparing Terracing Practices of Ancient Peoples

Chall: In your survey of land use practices in old lands, you noted that farmers in ancient periods developed terraces. Were these all the same type?

WCL: No, but all ancient farmers recognized their sloping lands grew less and less food as the years passed but that their level fields remained productive. They probably did not know of erosion as such, but they reasoned that somehow they must flatten the field with what facilities they had at hand.

In South America, the Incas did a fantastic job on ancient terracing. They used stone to build up terrace walls, often reaching upward as stairs or giant steps from the base of the mountain to the very top. Their masonry was superb. They rubbed these stones together and made them fit so closely that a pen knife could not be pushed between the stones. This masonry has stood intact through all these intervening centuries.

Chall: What an enormous amount of labor this must have involved!

WCL: They are simply fantastic! What population pressures there must have been on these steep slopes to make these ancient Inca Indians go to such lengths for strips of land on which to grow food.

WCL: The Ifuagos in the Philippines early developed contour farming primarily for the growing of rice, for rice ponds have to be kept level to hold water.

This early recognition of the need of level fields to maintain production seemed to have occurred around all populated regions of the world where increased food was needed for increasing populations.

I have referred numerous times to the fact that I believe the Phoenicians on the Lebanon mountains were the first to understand the problem of erosion on sloping lands and do something about it. As the famous cedars of Lebanon were cut for export, they cultivated the land.

To prevent it from washing off to bedrock, they built stone wall terraces from bottom to the top line of cultivation on their mountains. I have pictures of Beitadin and elsewhere, showing these giant stairways. The Egyptians gave Phoenicia the name "Arvad," which means stair. This particular type of terrace we found all over the Mediterranean world wherever the Phoenicians colonized.

Perhaps the ancients got the idea of terracing from the fact that all the eastern Mediterranean here is a karst landscape. Since limestone is laid down in water, the rock strata is more or less horizontal and of varying thickness and hardness. The softer stratum of course eroded more rapidly, but the harder ones resisted erosion and some hillsides, even though they have never been terraced by man, have the appearance of terracing from a distance because of the more or less contouring of the limestone layers. When limestone is newly exposed, there is considerable lime in the soil, but after long exposure, it is leached away.

Chall: How about the Chinese farmer?

WCL: There early began to be two types of terracing in China. In the northwest, in the wind-laid fine loess soils, there were no stones so the farmer could not make rock wall terraces. What these early farmers did was to leave strips of grass at boundary lines on the field and then they plowed down onto this strip of grass, and on the lower side, they plowed away from the strip. By this method the land gradually steepened on the grassy banks and flattened on the cultivated benches.

Then in my description in the written questions and answers, I went into detail of my fantastic view from the plane when flying over west China to Chungking and in my travels throughout Szechuan Province. All the hillsides are leveled into countless shimmering rice ponds that have to be seen to be believed. Stone walls were not used, but millions of hands over centuries of time

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*Chapter IX, Part 2.

WCL: built up earthen walls on which are planted broad beans or other vegetation, for never a foot of land that would grow food is allowed to go to waste in China in this region that has been densely populated for several thousand years.

The Making of a Research Scientist

Chall: You lay great emphasis on research. Did you find many young men interested in this?

WCL: Frankly, I have not found as many as there should be. Some in different countries I call My Boys, for when we began working together I tried to stimulate their scientific curiosity. I have always insisted that a research man should keep alert to find new and unexpected facts and ideas or leads and have the curiosity to follow them out as far as possible so as constantly to advance human knowledge. It always gave me great pleasure to return years later and see My Boys still working on interesting projects, whether in China, the United States, Israel or Africa.

Chall: Are such research people born or made?

WCL: Probably some of both. There is a lot of native curiosity in children as they grow up, especially if it is encouraged and stimulated and guided. In this, parents have a great opportunity in teaching them to follow up their curiosity and know why things are as they are and if they can be improved upon. This is a basis for training or development of interest that later may lead to the pursuit of research.

Then too, a child's teacher has often tremendous influence in stimulating a child's mind. I wish there were more teachers who took this responsibility and challenge seriously.

Professor Bessy--Great Teacher

WCL: For instance, I want to mention Professor Bessy, in the early days of the University of Nebraska, when he was a botanist at first but later became a very important authority on agriculture. I was privileged to become acquainted with quite a number of Professor Bessy's students. It seems that most of them became nationally known and many were recognized as international

WCL: authorities. Professor Bessy gave a tremendous stimulus to the pursuit of knowledge by the curiosity he created in the minds of his students. These students of his came largely from the pioneer prairies where new lands were being brought under cultivation and so it was natural that they should become specialists in agriculture in its many branches.

Chall: In your own childhood, did you show a bent for research?

WCL: Perhaps so. I had a great curiosity about everything in nature. I was a naturalist. When very young, I was interested in birds and I would stalk them, to get as close to them as I could without frightening them. I enjoyed trilling to them in imitation of their own trills. Sometimes we carried on quite a conversation, and my wife says I do it yet. Later, I was always eager to increase my knowledge along all lines. I liked the feeling of being a pioneer.

The Eleventh Commandment

Chall: Now I'd like to return to the trip itself. How was the Eleventh Commandment received by the people in Palestine when you first read it?

WCL: I feared the Jewish people might think this was presumptuous on my part; instead, I found that it was very well accepted. When I gave it in Israel years later, at the ground-breaking ceremony of our agricultural engineering building, there were tears in the eyes of Dr. Goldstein, President of Technion, and many others.

Chall: It is very unusual, placed in biblical language, and this probably makes it more impressive.

WCL: On the annual Conservation Sunday, especially in the rural churches, the Eleventh Commandment is often given along with the sermon, I am told. It is beyond the purely scientific, to recognition of an ethical responsibility for the good earth. Unless we do introduce and get applied this aspect, I don't see much hope of doing anything except to create a man-made desert out of the earth.

Chall: Has Technion in Israel made use of this Eleventh Commandment?

WCL: Yes. In the Lowdermilk School of Agricultural Engineering building, it is to be engraved in the main hall in large Hebrew lettering, along with a large oil portrait of myself.

TRAVELS ABROAD WHILE ASSISTANT CHIEF OF THE SOIL CONSERVATION SERVICE

Part 2 Return to China, 1942-1944

[Written questions and answers]

Chall: How did it happen that you returned to China?

WCL: Before I had my heart attack, I had been requested, through official channels, to go to China to assist the Chinese to increase their food production in the interest of the war effort. Then when I was incapacitated and in the hospital, our government approached the Chinese ambassador, the Honorable Hu Shih, to suggest that someone else be sent instead of me. But I was well known in many circles among the Chinese in Chungking, and the response was that they would await my recovery for it was their wish for me to come.

Ambassador Hu Shih gave us a reception and elaborate dinner party in the beautiful Washington Chinese Embassy, and sent me off with all the gracious courtesies for which the Chinese are renowned, including an appointment for me as a consultant to the Executive Yuan, or official cabinet of China.

Chall: How long were you away?

WCL: I left in September, 1942, and came home in March, 1944; so I was away from home about eighteen months.

Chall: Was it hard for Mrs. Lowdermilk to send you away so far and for so long, only a year after your heart attack?

WCL: Yes, of course, and to cover up, she made it a gala occasion with all the family at the depot and much laughter. But it might have been different if the family had known what lay ahead for me.

WALTER C. LOWDERMILK

Agricultural Adviser to the Chinese Government

By Hallington Bond

Sailing toward Chungking through dangerous seas and skies is one of the world's great soldiers of science. As I write this, America is undertaking to deliver to China a particularly valuable human lend-lease package.

This time Uncle Sam is shipping brains and leadership. It is returning to a land that respects learning above all else, one of that land's scholarly and trusted teachers. It is dipping deep into the national resource of experience and technology and imagination, to send its ally of the East a mighty exponent of farm and forest conservation.

Walter C. Lowdermilk is the man. His new job is first, to produce more food for fighting millions; second, to make safe and secure the soils on which walks the Chinese destiny.

Lowdermilk knows the soils, and the people of China. He knows, also, the soils and the people of the United States, of Europe, of North Africa, of Egypt, of the Near East. He knows languages. He knows how to work with his hands. Yet more important, he knows the uses of patience and of planning. Patience and planning in the Chinese situation must, in turn, entail courage and vision — and Lowdermilk's record reflects both of these qualities in generous measure.

He was born July 1, 1888 in Liberty, North Carolina. His mother came of blueblood English lineages, his father of Holland-Dutch land-having pioneers.

From a thirteen page manuscript on the life and career of Dr. Lowdermilk, written in 1942.

Harrowing Journey to China

WCL: Probably my travel route from Washington to Chungking, China, has never been duplicated by anyone else in the world. All arrangements had been made for me to fly the Atlantic and to India and on to China. But at the last minute, unknown to others at the time, our military decided to open the North African front. Suddenly all plane passages were cancelled.

I was taken to Charleston, South Carolina, and put on a cargo boat with a crew and nine other passengers. We did not know that we were on a ship loaded with bombs, neither were we told that the German battleship Von Tirpitz was raiding in the usual route across the south Atlantic and that our course had been changed.

We were surprised when we went through the Panama Canal and into the Pacific. We traveled the full length of South America without ever once sighting land. We pitched and wallowed through the "Roaring Forties," the "Howling Fifties," and the "Shrieking Sixties," in storms where storms originate. Often for days it was overcast and the captain could not take readings by the stars.

We occasionally picked up weather reports in Spanish to tell direction of the wind. No one aboard knew Spanish, and I remembered only a little from school days, but luckily, I was able to give the captain the weather information so he would know how to guide the ship out of the vortex of the storms.

After a time, I got my sea legs and spent hours on deck watching the angry waters lashing at our little ship. I was fascinated by the albatross and Cape Horn pigeons that traveled with us day after day, regardless of flying conditions, sharing our leftover food. What marvelous flying machines they were! I wondered why airplane designers did not study and imitate their flying and gliding techniques.

During storms I often remarked as I watched the driving rain come down in torrents, "What is more useless than a rain at sea." We had a small library on board and as the weeks passed, I read every book from cover to cover, including many of the sea stories by Conrad.

We rounded the Horn, which is really an island. Then we proceeded into the Atlantic, and our route took us to the south of the Falkland Islands, and then northeastward up toward Capetown, South Africa. Altogether we were on shipboard some sixty days without ever touching land.

WCL: Now we came to the most dangerous part of the trip for the German and Japanese submarines concentrated on this point of Africa where all ships had to pass. We knew they were both in front of us and behind us. I spent much time in the log room with the captain as the S.O.S. messages came in from torpedoed ships in distress or sinking. Our captain originated his own zigzag course and required that it be religiously followed. Once we saw a lifeboat with a distress flag, but found the occupants had already been picked up.

We had one very sad experience. A boat had been torpedoed and sunk. The crew were in lifeboats. Although it was exceedingly dangerous for us to stand still and be a sitting duck for other torpedoes, our captain ordered us to go to the rescue. The sea was choppy and rough, and it was slow work getting the lifeboat alongside our ladder. Some of the men were in the water.

One by one, the men were hauled up onto our deck. The captain of the torpedoed ship was the last one. He reached and got a hold on our line, when suddenly a wave trough carried the boat away from under him before he had sufficient hold. He let go the line. Frantically our crew tried to save him, but he sank and never came up.

Some of his crew said that he was loaded down with gold that was being transferred by the ship, and that was doubtless the reason he could not struggle to save himself. As we left this tragic experience, I kept repeating that refrain, "Many brave hearts are asleep in the deep." Especially was this so in this lane where several ships daily were sent to the bottom.

Chall: The human and material losses in war are terrible. Did you expect momentarily to be struck with a torpedo?

WCL: Yes. There was more than a fifty-fifty chance that we would be, but we managed to arrive safely in Capetown where orders sent us on toward Kerachi, India. As we rounded the island of Madagascar, one of our engines exploded and we had to go into Durban for repairs. The American consul said it would be at least three weeks before there might be an available flight reservation to Calcutta.

Fortunately, I had an old Oxford friend, Bill Watt, who was now head of the Forestry Department of the Union of South Africa. He took me on some wonderful field trips, which made profitable use of my waiting time.

Flying Over Africa and the Middle East

WCL: My trip by a big old-fashioned BOAC "flying boat" was the most enjoyable travel I ever had. The great wings were above the windows which sheltered them and made visibility excellent. We stopped on some body of water each night for eight nights and slept in hotel beds.

The plane flew low whenever the pilot sighted a herd of elephant, antelope, giraffe or other wild animals and made them scatter, so we could see them in flight. Often he flew low so that large groups of crocodile scrambled into or out of the water; startled hippos did the same, not knowing which place was safest from our huge noisy flying bird. So there were fascinating traffic jams.

This flying boat flew sufficiently low so that we had a fine view of the country and I could read the landscape. I astonished the passengers by telling them the various types of soils as we flew over. When they asked for an explanation as to how I knew, I explained that I could tell by the huge ant hills, sometimes many feet high. The color of these ant hills enabled me to recognize the type of soil the ants had excavated and brought to the surface.

Chall: Could you see much of the type of agriculture in Africa as you flew over?

WCL: Yes, I was constantly reading the landscape and taking notes on what I saw. In one enormous area, rather thinly populated, indicated by the sparsely spaced Kraals surrounded by thorn bush, we saw hundreds of slanting columns of smoke rising from fires in the bush which the natives set annually to clean the land for sowing a new crop, or to grow new grass for their herds.

While flying down the Nile, I kept looking for good sites for hydro-electric power plants. I saw many such sites as the White Nile dropped down about four thousand feet from Lake Victoria to the Sudan Marshes, and visualized the tremendous possibilities of this region when the five to ten million acres of marshes in the Sudan would be drained and used for fertile farm fields and irrigated with waters now wasted in evaporation. This water would not only irrigate all these lands but deliver a greater amount of water down river to Egypt.

My impression of Africa, as seen from our hydroplane, was that it was a vastly underpopulated and underdeveloped continent.

The same BOAC hydroplane dropped us down on the Dead Sea for re-fueling and then on we flew over ancient Mesopotamia. Here in

WCL: modern Iraq, we saw the marks of ancient irrigation of the vast and beautiful alluvial lands of the Tigris-Euphrates Rivers. Instead of desert sand dunes, we saw vast areas of soil dunes. Actually they were miniature mountain ranges of silt eroded from over-grazed watersheds to the north. Sometimes ten to fifty feet high, they had been lifted out of irrigation canals that reached far out herringbone-like on either side of both the great rivers.

Chall: If you like to read the landscape as you fly over it, this must have been a fascinating trip for you.

WCL: Yes, more fascinating than reading a novel. In western India, I saw hundreds of dams that had been built to store water for irrigation, but were now silted up with erosional debris, brought down from their drainage basins. The poor farmers were cultivating the silt surfaces within reservoirs but had no irrigation waters now.

Flying Over India to China

WCL: Before landing on the Ganges River at Calcutta, we saw networks of irrigation canals that had been built by British engineers, extending over a large area of central India.

From Calcutta, a Flying Tiger pilot flew us over Assam, in a highly camouflaged plane flying low to prevent its being silhouetted against the sky, thus inviting an attack of Japanese fighter planes, then patrolling this region.

Then we began to climb and climb, for we had to go over an eighteen thousand foot pass in the Himalaya Mountains into southwest China. We had no oxygen and no pressurized cabin. I made myself comfortable, prepared little pellets of smelling salts easily reached, leaned back in my seat and breathed deeply and faster than usual--and then hoped for the best.

My heart behaved beautifully and when the trip was over and we landed in Yunan Fu, southwest China, I was elated and thankful that this flight "over the hump" into China was successfully over with no bad results. It had been three months since I left home.

Mrs. Lowdermilk Waits for News

Chall: You seem to have had a remarkable and unusual travel experience

Chall: during these wartime days. Could you get word to Mrs. Lowdermilk?

WCL: No, and for many weeks, I was completely lost track of. We couldn't use radios, and the first port we reached was Capetown, sixty days after leaving home. I had written the family daily and on arrival sent this continuous letter by mail at once, but during war days, mails were very slow.

After weeks and weeks without word, my wife finally heard from the State Department that "Dr. Lowdermilk had been traced to a boat that had had an accident outside of Madagascar, but they did not know whether the boat was torpedoed or what, or whether the passengers were safe or not." Then later came the letters, which she made into two articles which were published in the magazine, American Forests, probably during the first part of 1943.

The journey had actually been much harder on my wife than on me. For I knew I was alive and safe, and she knew that if it was humanly possible, I would get word to her; and when weeks passed and no word came, she naturally feared the worst.

The Flight to Chungking

Chall: Did you remain in Yunan Fu to rest up after the strenuous ride "over the hump"?

WCL: We only remained long enough to change from our large plane to a smaller plane for the short flight to Chungking, China's new capital. The next morning we flew up into the cloud bank which covers west China during winter months. I would like to enlarge on this: the clouds blow in from the coast fifteen hundred to two thousand miles away and bank up against the high mountains of Tibet. There is never any sunshine for weeks in winter except as there is a rift or temporary canyon in this huge cloud bank.

Though the temperature never gets very low, the climate is damp, raw and chilly. Despite this fact, many vegetables continue to grow through the winter. The sun appears so seldom in winter that dogs bark at it as at a stranger--so goes a Chinese saying.

The Terraces of Szechwan

WCL: On this last lap of my momentous flight from the United States into Chungking, west China, I figured I had traveled ten thousand miles by boat and nine thousand miles by plane. Now I was in the cloud bank that seemed to be a solid mixture. Suddenly, a great chasm appeared below us in the cloud bank, which grew wider and wider. Then I had one of the most fascinating experiences of my life as I studied the intricate patterns of hill terracing in Szechwan.

Many were rice fields now under water, and as the sun broke through, it reflected light as facets of giant diamonds. My mind was fascinated with the countless intriguing patterns of terraces of varying designs to fit all types of drainages.

What an achievement! What I saw was marvelous, fascinating, astounding, wonderful! Here was an entire landscape which represented the labor, care and love of the land by millions of people through many centuries of time--and the work had been successful in the extreme. Here was intensive cultivation of well watered sloping lands and yet not a sign of erosion anywhere.

Why have not our poets, artists, philosophers, our economists and scientists and our agriculturalists recognized the magnitude of this amazing accomplishment? To me, these achievements were far more imposing than the pyramids of Egypt, which are so famous yet took only twenty years of slave labor to build. Here, Chinese farmers have fashioned the surface of the earth to the uses and needs of mankind, and have maintained a permanent agriculture for centuries past which they can continue for centuries to come.

I determined to write up these fascinating terraces of Szechwan when I returned home and had time, but somehow, I never found the time. But when China is again open to tourists into this marvelous back country, I hope that others will have the time and the descriptive words and the art, to paint a written picture of this fascinating landscape.

Arriving in Chungking

WCL: We bored through the clouds at Chungking, one thousand miles inland, at the junction of the Yangtze and Kialing rivers and landed in close quarters in the gorge on a small island.

Here, at Chungking, the Yangtze rises ninety feet in a

WCL: season, and this was low water in winter, for though I left the States in September, it was now December 10, 1942. We got into our individual sedan chairs and were tilted back precariously while our chair bearers climbed with us 364 steps up to the city, grunting and chanting rhythmically. The first thing I wanted to do was go to the U.S. Embassy and announce my safe arrival and get my first mail from home.

Life in Chungking

Chall: What was going on in the Chungking area at that time?

WCL: Millions of Chinese were killed when the Japanese invaded China, but China did not surrender. Instead one of the greatest dramas of her long history was enacted. Into this little-known part of China came a tidal wave of fifty to seventy million souls fleeing from coastal areas.

They came by every means imaginable, on foot, by Chinese junks on the river, by wheel barrow, or sedan chair, in carts, on donkeys or horses, or with the modern speed of steamers, autos or tri-motored planes. It had been a question of "Go west," young and old, rich and poor, artisans and professors, industrialists and farmers. They had come back to where Chinese civilization had its birth.

More than thirty colleges and universities moved what equipment and books they could, by any means possible, and carried on with poor equipment but inspiring esprit de corps. Here, in Szechwan Province, against a literal wall of the snowy mountains of Old Tibet, China established her base for resisting the Japanese invaders.

What a human drama for historians to write about. Men, women and children were busy scrapping up the debris of bombings. New buildings were going up everywhere. Streets and shops were crowded. People laughed, joked and sang. Here they were free--except for the bombings. For during the eight years of war, Chungking lay almost defenseless under raid after raid of Japanese bombers.

Chall: Did any of these bombing raids take place while you were in Chungking?

WCL: Yes. There were frequent siren warnings that planes were enroute

WCL: west with some city as a target, but they could not always find Chungking through the vast cloud bank, so I did not suffer an actual attack; but everywhere I saw the tragic evidences of former raids where planes could attack without fear of anti-aircraft gunners, for there were none.

A Critique of Pre-War Japanese-U.S. Relations

WCL: I would like to digress for a moment regarding this war. We old China hands knew that a Japanese war on China would be inevitable if we continued to pursue our policy of trade with Japan. We, as a nation, scarcely protested when a Japanese army marched into north China, stating that it was only to protect her nationals and control the bandits. Since England was trading with Japan, we also wanted trade.

At this time, most of our cities were digging up street car tracks and our western ports were filled with boats carrying this vast "steel mine" to Japan. We were also providing Japan with all her aviation gasoline and planes with which to bomb the Chinese. We provided Japan with all she needed for her plans for aggression in China except the aviator.

For six years before Pearl Harbor, I talked incessantly and at times wrote letters to editors, saying that we were building up a "Frankenstein" that we might or might not be able to defeat. But no one paid attention for we had an enormous trade with Japan in these war materials and we wanted trade. We old China hands had been predicting that Japan was pulling the wool over our eyes and that when she was ready, she would strike us suddenly and knock us off balance.

I was not surprised by the catastrophe at Pearl Harbor. My reaction was instead, "Well, at last it has happened." The next morning I took down to the Department of Agriculture a letter I had written to the New York Times, six years before Pearl Harbor, and gave it to others to read. Japan's policy and surprise action was so accurately predicted that they all thought I had just written the article.

Then their reaction was, "Why didn't you get this across to our government?" But it had taken Pearl Harbor to open our eyes and change our policy. Also, the "Frankenstein" we had built up required ghastly loss of life and expenditures to defeat.

Meeting Old Friends

Chall: It must have been quite inspiring to see the spirit and courage of wartime China out there in the west.

WCL: Yes, it was. It was like a joyous home-coming. Friends with whom I had worked for five years on my previous Famine Prevention Program and had not seen for fifteen years, along with numerous Chinese officials, met and welcomed me with great enthusiasm. D. Y. Lin, chairman of the Yellow River Commission, with whom I had worked in 1922-27, was in charge of all plans.

So in Chungking we worked out the over-all program for our eighteen months of projects. I had been asked to come to help the Chinese fight erosion and to grow more food in the interest of their war effort. We were to take an expedition into northwest China where droughts, famines and floods create a tragic condition for Chinese farmers who are naturally hard-working and courageous.*

We were unable to get a plane reservation for Chengtu, the capital city 250 miles away, but traveled in a postal truck which gave us much local color. The truck had the maximum number of mail bags and passengers who paid in advance for their tickets.

Then the driver packed in extra passengers, called "yellow fish," whose fares he took for himself; so we were fitted together like sardines, each clutching some valuables--mine were cameras. The weather was cold, but body warmth kept us from freezing as we jolted along. Thanks to the wonderful Chinese sense of humor, frequent laughter relieved our discomfort.

Chall: Where were your headquarters in Chengtu?

WCL: The West China Union University, that was acting as host to a number of the universities from the coast that had come west, also acted as our host and gave my staff and me office space and helped me gather together, for our surveys and demonstrations, a staff of eight highly trained Chinese specialists in soils, agriculture, irrigation, hydraulic engineering, forestry and range management. All but one had worked with me before.

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*More detailed information about this trip to China can be found in an article written by Dr. Lowdermilk, "China Fights Erosion With U.S. Aid," in the National Geographic, June, 1945, pp. 641-680.

Preparing For the Project

WCL: The government was eager to cooperate with us. They bought from a missionary a station wagon, large enough to carry all nine of us and a driver who was also a trained mechanic. It was especially equipped with truck wheels for bad roads, of which we had plenty. But we had no break downs or accidents in the six thousand miles of travel over all kinds of roads during the seven months of field work.

Wartime inflation was terrible. At first, gasoline cost us from twelve to fifteen dollars (United States money) a gallon, for it had been hauled over The Hump at great expense. This stimulated substitutes--wood alcohol, camphor, tung oil cracked to make a foul-smelling motor fuel. In northwest China we used gasoline refined from oil wells near Yumen.

This staggering inflation dominated everything. I wanted a little twine and paper for a small gift and it cost me seventy-five cents, U.S. money. I paid three dollars for a half-dozen oranges right where they were grown. Missionaries were selling their personal possessions for food. One sold a ten year old bicycle for six hundred dollars. Students and professors were often emaciated from lack of proper nourishment, for they could not live on their salaries. I looked at a leather jacket for $1,700, U.S. dollars, and a typewriter selling for $20,000.

Chall: Who paid for the heavy investment for this expedition?

WCL: Of course, the United States government paid my salary. But the Chungking government set up a fund for our travel and for the salaries of our Chinese specialists, perhaps from funds or grants-in-aid from the United States--I never was able to find out. But there seemed no shortage for our needs.

During our travel preparations in Chengtu, the Governor of Szechwan Province invited me to a reception in celebration of the abrogation of treaties of extraterritoriality by China, Britain and the United States. During all my years in China, America was the favored nation and still was at that time.

Fifty foreigners were among the many Chinese there. On the wall of the great hall were flags of the three countries and pictures of Generalissimo Chiang Kai-shek, President Roosevelt and Prime Minister Churchill. The governor made a spirited talk to which an American and a Britisher responded.

I had a few trips out onto the great Chengtu Plain, one of the most remarkable agricultural areas I have ever seen. It is

WCL: called the "great red basin" because of its red earth, which for centuries has supported one of the densest populations on earth.

The plain was teeming with Chinese in bright blue garments. On every road were endless lines of two-wheeled trucks and wheelbarrows, drawn or pushed by men or sturdy boys, taking lumber, salt, coke or food stuffs to Chengtu.

Our auto with its raucous horn sent pedestrians, donkeys, and carts scurrying for safety. Until twenty-two years before my arrival, there had never been a road in all this area wide enough on which to drive a car, and the only wheeled vehicle of any kind was a squeaking wheelbarrow.

Opening the Waters at Kwanshien

WCL: The Honorable Chang Chen invited us to attend the official annual ceremony of the opening of the irrigation waters at Kwanshien. This project has enabled the people of this Chengtu Plain with more than two thousand people to the square mile, largely living off the land, to be free of famines or floods during 2,250 years.

To go the forty miles there, we traveled over the first auto road ever built in the province. It was a beautiful, lush landscape. A third was golden with blossoms of mustard-like rape, the seed of which is grown for cooking oil. Winter wheat was just heading, and on banks between fields were the ever-present dull green of broad beans.

No field was allowed to lie idle summer or winter here on the plain. A few fields were dainty spots of "pink clover," a legume that is inserted now and then in the incessant crop rotation. Farm houses with white stucco walls and dark wooden frames, topped with gray tile roofs, were picturesque among groves of waving bamboo around each farm house.

In Szechwan, the bamboo grove, sometimes growing to a height of one hundred feet or more, is the multi-purpose woodlot. It furnishes bamboo sprouts for food, and culms or posts for fences, implements, tools, furniture, paper, carrying baskets, house construction and abundant chopsticks for everyone.

Twenty-two centuries ago, a remarkable Chinese engineer by the name of Li Ping, without concrete or re-enforcing steel, built

WCL: one of the most successful and unique irrigation works that has withstood failure during all these centuries. The Min River flows out of Tibet as a clear stream. Winter flow is low, but summer stages from melting snows and rains are very high.

Li Ping did not have to deal with silt, as I told you about on a former study of the King River irrigation project begun in 426 B.C. But he had the problem of boulders and gravel or bed load moved along the stream bed.

Li Ping's plan was simple. He had only hand labor, simple tools and wood, bamboo and stones picked out of the stream bed. With these he built uncemented but well-designed structures to divert water as he chose. He cut a canal through the toe of a slope of hard conglomerate rock, which fixed the size of the intake for the inner canal. The main river was to serve as the outer canal for irrigation and to carry away flood waters.

To divide the waters, he established a strong point, called a "Fishes Snout," in mid-stream, by piling up year after year great boulders and gravel excavated from channels on each side, to divide the current into two feeder canals.

Lower down stream these were divided into nine canals to distribute flood waters. These were further divided into laterals and sub-laterals, providing irrigation water to an average depth of seven and a half feet for the entire Tu Kiang Project of a half-million acres.

Being a clever engineer, Li Ping knew that gravel and boulders would have to be cleared away annually to maintain equal parting of the waters into two canals. In order that this was done, he made it a religious function. He set these forth in six characters plainly carved into a prominent wall of the Erwang Temple. The translation is: "Dig the channel deep and keep the spillway low."

He buried at the required depth for excavation three iron dragons or bars of iron ten feet long and seven inches in diameter. With these six characters, Li Ping set forth the regulations for the maintenance of the Tu Kiang Irrigation Project which for more than 2,300 years has watered the fabulously productive Chengtu Plain that has never had a famine or a flood.

Some modern engineers had wanted to "improve" this project to create electric power also, but the Chinese farmers would not permit any tampering with this project which has been so successful through the centuries.

Chall: This must have been quite a thrill for you as a hydrologist to find still in use an ancient irrigation project, conceived by an

Chall: engineer so long ago, and built without modern tools or equipment.

WCL: Yes, it was, and I felt most fortunate to happen to be there at the annual celebration of the "opening of the waters" for a new irrigation season. There were some forty thousand of us at the temple on the river bank for the ceremonies led by the Governor of the Province. Priests sacrificed two sheep and two pigs before the altars of Li Ping and his son, Er Wang, who completed the project for his deceased father. Then officials bowed before the images amid the noise of temple gongs.

After the ceremonies, amid deafening sounds of bursting fire crackers, we went to the river bank to watch twenty men pulling on a bamboo cable to turn over the temporary wooden tripods that had held back the coffer dam and waters while the inner canal had been excavated to the prescribed depth. Then amid wild cheers, the life-giving waters rushed through the opening and the inner and outer canals were ready for another of the 2,300 year old series of consecutive irrigations.

The Staff

Chall: How long did you remain in this Chengtu area?

WCL: We spent almost three months training our staff for the survey of the use of land in northwest China and acquainting our field staff with the principles of soil and water conservation as they had been worked out in our national program in the United States.

We gave special emphasis to adaptation of findings in America to conditions in China. As always, I wanted to know what the Chinese farmer had done and to evaluate his practices and see where we could add to his methods to make best use of soil and water.

The devoted and diligent Chinese colleagues of my staff mostly spoke English fluently and this was helpful to me in scientific discussions with them. They in turn benefited.

Mr. Ren Chen Tung developed a successful model community in the upper Yellow River near the big loop, with schools and full employment. He was a farmer's son and became a modern farmer and trained others to be expert farmers. Then Mr. Li Teh-I became a scientist and an able administrator.

WCL: Mr. Chen Hsio Li later became Chief of the Forest Service in Taiwan (Formosa). Dr. Y. H. Djang, who has just visited us in Berkeley (July, 1967), with his fine family, has been for some years in the United Nations Food and Agricultural Organization assisting African nations in their hydrology problems.

Mr. Liang continued as a prominent engineer and Mr. Wu, as a Forest official, both in the Chinese government. Mr. Chen, a scientific soils man, continued making soils surveys in China and Formosa.

Dr. Feng Chao Lin, whom I helped to come to the United States to get a Ph. D., was a close companion who helped me greatly by our private talks together. We heard later that he was liquidated by the Communists because of his friendship for me and for America. Also there was Yeh Pei Chang, director of our demonstration projects, who continued this type of work, along with Tsiang Teh Chin, at least until the government fled to Formosa.

Chall: This must have been an interesting and congenial group. Were they always harmonious?

WCL: Yes, I would say that we were a very happy group and there was no friction as far as I knew. We all have many delightful memories of our experiences, though some were difficult, such as when we would come into an inn from a long day of dusty travel and the maximum amount of fresh water we could get with which to clean up was a small wash pan of water which became muddy after just a face-washing.

Sometimes it was difficult to get food that we enjoyed, but we generally had eggs, pickled vegetables, often including alfalfa tips, which I learned to like. In west China we had plenty of rice, but in the northwest where no rice is grown, we ate as our "staff of life," either wheat or millet or bean curd.

The Chinese have a saying that cold water makes one sick, so we were always able to get hot tea, though sometimes the "tea" consisted of any kind of flavorful leaves, if no real tea leaves were available in the area.

Graves Near the Cities

WCL: One thing I have forgotten to mention is that especially in the densely populated areas around cities, graves are everywhere.

WCL: The landscape appears covered with big brownish bubbles--graves: for the land must support a double population and supply not only food for the living but also space for a host of ancestors.

China has "borned" so many billions of souls that formerly it was the custom at the change of each Dynasty to level all graves and begin again. I have wondered if the Chinese Communists, who have tried to do away with ancestor worship and reverence for the past, have permitted this waste of good land to continue. I doubt it. The only utility of these grave lands was to grow grass for fuel which when dry, was shaved off as though with a razor. It might have been more advantageous to grow vegetables on them, but this was not done.

Traveling Into Northwest China

Chall: You seem to have been very enthusiastic about the Szechwan lush landscape and its fascinating rice terraces. Did this make the field trip less interesting when you left Szechwan for the northwest?

WCL: No indeed. For as we went northward over the mountain range, we passed through some of the finest scenery I have seen anywhere. We crossed the border mountains; from these Kunlun mountains of central Asia, which separates the sources of the Yellow and Yangtze Rivers, this range runs eastward almost to the coast.

North of this mountain barrier lies the largest blanket of loess, or wind-laid soil material, on earth. It probably dates to the glacial period in America and Europe, but here there was insufficient moisture to support an ice sheet. High winds eroded a vast area of dry lands bordering the great Desert of Gobi into clouds of dust that settled on the country to the south and east and left multitudes of dunes.

A mantle of loess accumulated over a vast dust bowl and smoothed over a formerly rough topography. Some of the material was carried away by streams to form the great delta plain of the Yellow River. This blanket of yellow soil material of talcum-powder fineness is about five hundred feet thick near its origin, but gradually thins out to the south, east and west until the deposit disappears.

Nowhere else on earth have I found such a beautiful land so deeply and widely gullied. Long cultivation through the

WCL: centuries has exposed sloping fields in the loess to sheet and gully erosion. On this wartime trip to China, the American army gave me astounding air photographs of this region which were confidential at that time, but which I shall file with my documents.

Establishing Demonstration Projects

Tienshui

Chall: Where did you begin your demonstration projects?

WCL: Our first work was in the vicinity of Tienshui, southern Kansu, in the upper Wei River Valley. We studied in detail the condition of lands and measured up hundreds of fields after heavy rains, to determine the critical slope at which storm runoff began to erode the slopes on cultivated fields.

We put in experimental strip crops of alfalfa, rye grass, and sweet clover mixture, to discover how nearly we could get full absorption of rains on sloping lands.

There was no runoff on flat lands, for loessal soils absorbed all the rain that fell. If all rain waters on sloping lands could be absorbed as they fall, then there would be no soil erosion, no loss of fertilizers, no loss of beneficient rains, no silting of streams, and maximum crops could be harvested.

We were delighted that at the end of the 1943 rainy season, the heaviest in sixteen years, we found our demonstration of narrow strip cropping on the contour with a contour channel had prevented any runoff on slopes up to twenty-four percent.

The farmers of the region watched us like hawks. No one does anything to the land of China without their approval. If our work had done damage to the land, we would have been run out. But as they saw the success of our demonstration and the greater production because more moisture was retained in the soil, our work met with the approval of the Chinese farmers.

But the steep walls of gullies, large and small, from a few feet up to five hundred feet in depth, that have cut back into the slopes through the centuries, are a difficult and different problem. These raw surfaces were a loss and a menace. They yielded little or no useful crop but gave rise to flashy

WCL: runoff from rains that cut and carried great quantities of earth, enlarging gullies and filling streams with enormous burdens of troublesome silt to damage other lands and interfere with flood control or irrigation works.

Chall: Did you devise plans to prevent further erosion?

WCL: We worked out a novel plan for revegetation of these gullies. Clay pellets containing seeds of grasses, shrubs, and trees together with fertilizer, would be dropped from airplanes like incendiary bombs after soil-soaking rains. This called for nurseries to grow seed in quantities large enough to make up millions of pellets with marble-making machines. We established one such nursery as a demonstration.

Also we proposed to build thousands of soil-saving dams to collect silt in flat stretches of great gullies to build up alluvial areas for farming, and also to reduce the silt load of streams. We also called for poplar and willow plantations along streams to be used for bank protection structures.

Siking

WCL: When our preliminary work here at Tienshui was under way, we traveled to Siking, the present capital of Shensi Province, on the wide alluvial plain of the Wei River. The old city on this site was called Changan, capital of the Han Dynasty two thousand years ago, when it was one of the great metropolitan cities of the Orient.

As I looked over the plain, I was mystified by hundreds of earthen pyramids or tombs. How could these have been built when there were no earthen or borrow pits for such vast amounts of earth to have been dug?

After I was there in 1925-26, my good friend Li Hsieh, who was Chief Engineer of the King River Irrigation Project and a member of the Yellow River Commission, had died. To do him honor, each farmer had brought a measure of soil from his own land to make up a memorial mound on which I later placed a wreath to do him honor.

Then I realized that these great numbers of earthen pyramids during and after the Han Dynasty, had been built up during the past two thousand years probably in this same manner!

More Silt in the King River

Chall: I remember your telling of the King River Irrigation Project on your former trip to China, and how it had gone out of commission time and again because of silt.

WCL: Yes, and this had happened again. Our party was taken to see a new diversion dam built in 1935 just above the last intake of the former defunct project.

We examined the first intake, cut in 246 B.C., and found the river to be forty feet lower, doubtless scoured out by higher flood stages. So periodically engineers had placed the intake higher and higher up in the canyon. The modern diversion dam was built up above the last intake.

One must come to the conclusion that if floods are to be controlled in the delta plains, waters of the river and its tributaries must somehow be relieved of their burdens of silt, especially if used for irrigation. This has not only been the curse of the Yellow River, called "China's Sorrow," but of many rivers throughout the world.

China's cultivation of slopes cover two to three thousand years, while after only a hundred years or so of cultivating slopes in the United States, erosion has caused critical silting problems.

This will require in China as elsewhere a long-range program of control of soil erosion and conservation of soil and water on farm lands, and revegetation of gullies, even through, in this case, the vast loessal highlands.

Settling the Refugees

Chall: You mentioned the fifty to seventy million refugees that had fled from the coastal areas back to their far west. How did they make a living and where were they settled?

WCL: Of course many artisans, professors and businessmen continued their former professions. But the farmers were a different problem. New lands had to be found for them. We visited one of the largest resettlement projects of the central government at "Yellow Dragon Mountain" (Hwanglungshan).

This land had been empty since a Moslem invasion a hundred years before had depopulated the area. We spent some time

WCL: looking over the project, talking with the refugees and putting in demonstrations on their fields. Though in primitive camping conditions, the hospitality of these proud people was very real and dignified.

These new farmers from delta lands had no traditional knowledge in farming this type of landscape, and we felt we had been able to be of real help to them.

At our big final demonstration, more than three hundred farmers among these refugees came to see their first surveyed contour furrow and to learn how to make A frames and V drags, to build broad-base terraces, and to sow strip crops. Many farmers asked help to put these measures in on their own lands. We learned afterward that about ninety percent of the farmers of our demonstration project area had done so.

Hwakialing

Chall: Are you still working your way farther inland?

WCL: Yes. We next went to Hwakialing, at an altitude of 7,500 feet, at the junction of three important highways. Here, the line of cultivation that was begun about three thousand years ago in the alluvial plain about Siking reached this high elevation only about one hundred years ago, and lands had suffered little from soil erosion. Only summer crops of wheat, millet, buckwheat and rape seed can be grown.

In these loess lands of northwest China, the Chinese farmer long ago developed the remarkable practice of benching his land, to safeguard it from erosion. These bench terraces give the landscapes of the loessal highlands a fantastic appearance. But this measure, as it has been applied without scientific exactness, has not been sufficient to prevent serious erosion damage in many places.

These benches are not like the Szechwan terraces, climbing the slopes in which there is no evidence of any erosion at all through the centuries, for these were level for holding water for growing rice, and were a complete success.

In these attempts to cultivate the sloping loessal lands out in the northwest, the lands were not benched according to sound principles of soil and water conservation, which calls for exact layout with engineering instruments and for other supporting measures of contour channels and strip crops.

WCL: In all our demonstration projects, we combined modern methods with what the Chinese had been doing for centuries without the aid of technical help. All the Chinese farmer here had to aid him was the little yellow cow to pull a very primitive plow which the farmer had to lean on heavily to hold it in the soil. He had the traditional knowledge and experience that by plowing toward the terrace on the upper side and away from it at its base, the dividing bank grew higher and the cultivated benches flatter.

Without the aid of scholars and technical assistance, the hard-working Chinese farmer did his very best to save his lands from erosion, but in spite of all his efforts, storm waters cut gullies through his bench terraces. For these fine loessal soils are exceedingly erodable.

Life in Caves

WCL: It was in these fascinating loessal lands that I found that millions of people were living, not in houses, for there was little wood, but in caves dug into the slopes, which are cool in summer and warm in winter. On flat land there was an open sunken court with one entrance sloping from the surface downward. From this courtyard opened the various cave rooms of the home.

At the entrance to the incline down to the house, fierce dogs were chained and kept hungry to notify householders of any strange arrivals.

It was in this area in 1923 that there was a severe earthquake which caved in so many homes and villages that the loss of life was never known, but estimates were in the millions.

Chall: Your wife said that when you were in China the first time, each morning while shaving, you would declare, "I must cross Asia, I must cross Asia." Did your dream come true on this trip?

WCL: Almost, but not quite. But it gave me a thrill to be on the old silk route between Mesopotamia and China, and still watch the camel caravans--camels with two humps--plodding along with their loads, grumbling and groaning but with heads held high, just as though it was in ancient times, unaware that the twentieth century had arrived.

One of the memory pictures I shall never forget was near the Gobi Desert in an inn. I was asleep and suddenly was awakened by the tinkle of bells. I looked out to watch a long line of camels in the moonlight, as they plodded slowly with their heavy loads

WCL: to the rhythmic tinkle of bells. They had just crossed Asia!

Dr. Lowdermilk Given Precious Gifts

WCL: The governor of Kansu, the most remote province of northwest China, gave me a precious gift of a perfect piece of pottery, dating back to Neolithic times, that had lain in a recently exposed tomb perhaps for seven thousand to ten thousand years.

Mr. Anderson, the famous archaeologist of Sweden, who had made a study of this ancient pottery, said he felt my pottery vase was about ten thousand years old. My wife has been prodding me for twenty-five years to have it tested for age by the new carbon methods. If it is that old, she wants it put in a museum.

The governor of Shenshi Province gave me a beautifully woven rug in appreciation of what we were trying to do for the farmers there.

Traveling to Tibet

The Great Wall of China

Chall: Were you still heading westward into the interior?

WCL: Yes, we were headed on toward Asia. I had seen the Great Wall of China at the coast. Now we were wandering along out toward its westernmost end, two thousand miles from where it started. It has been said that this Great Wall of China is the only man-made structure on earth that could be seen from the moon.

The eastern portion was made of stone, but out here in the Corridor, it had to be made of tamped earth, which was more rapidly melting away in the storms of centuries which have beaten upon it.

Engineers have figured that this great serpentine wall

WCL: writhing up and down and around and about north China contains enough material to form a wall three feet thick and eight feet high around the earth at the Equator.

The Peita River was undermining the last huge tower at the westernmost end, and I jumped back quickly from where I was standing taking pictures, when I discovered I was on a three hundred foot precipice, protruding far out over the gorge.

Chall: Why did the Chinese build this Great Wall?

WCL: Well, again I say, as I have before and as I pointed out in my article, it is the old Cain and Abel story of the Bible, the eternal conflict between the farmer and the shepherd. This monument of engineering achievement is also a monument to an equally great failure of governments in times past to harmonize grazing and farming.

The same elements that cursed northwest China for two thousand years are still present. I did not see a stack of hay for winter feeding of the nomads' herds that must come in off the cold steppe in winter. This Great Wall was built to keep out the nomads and their herds from the fields of the Chinese farmers. Improved welfare of the region called for hay to feed and fatten the herds coming off the summer ranges in the interests of farmer and nomad and of the towns.

Touring Tibet: Lake Koko-Nor

WCL: One of my goals in crossing Asia was to go to Lake Koko-Nor in Tibet, and in this my dream was realized. It is a gem of sapphire set in an emerald basin, bordered by green-clad mountains capped with snow. Its surface is ten thousand feet in elevation. It is the highest salty lake in the world.

Here in the summer are the grazing grounds for the nomads. Herds of yak are everywhere; commerce is carried out of Tibet into bordering towns on these domesticated yak. All out of doors seems to be air-conditioned; the scenery is beautiful. When planes can fly the hot and weary city people here during long hot summers, this will be a vacation paradise.

Kumbum

Chall: How far into Tibet did you go?

WCL: Our party went to Kumbum, the second most sacred place in Tibet, next to Lhasa. I never saw so much gold as here: the temple statues were covered with gold leaf, the carved spires, sometimes the tile, were covered with gold leaf, and generally the great prayer wheels were at least gold covered, if not solid gold. I have wondered many times whether the Communists, when they took over this part of Tibet, permitted all this gold to remain for decoration, instead of being used to promote the revolution.

The red-robed lamas here are permitted to marry while the yellow-robed priests are not.

The chief monk here at Kumbum put on a wonderful show for us and I was permitted to take color movies, which showed the entire group of monks in a parade through the temple courts, bedecked in their gorgeous red tapestry robes with their high plumed head dress.

The movies I took on this 1942-44 trip to China I showed at the National Geographic Society's Friday evening lecture in Constitution Hall, to an audience of about forty-five hundred people. They clapped at this rather spectacular parade of Tibetan monks in their finery.

Also, this trip was written up as the leading article in the June, 1945, National Geographic Magazine, which included many of my pictures.

Chall: Did you meet any high officials in this far interior of China?

WCL: While out in this northwest area, we visited the main camp of the commanding general of the region, General Mah Bu Fang, for several days. He raised horses for the army on these beautiful grass lands. I admired some very much and rode the General's spirited horse, to the consternation of my Chinese group and the cheers of others. They had not realized that my years in the Forest Service had helped me to be an experienced horseman.

There were about three thousand men in this camp. I do not know how many other camps the General had. They were far removed from industries so they were a unique army. I was astonished to find that the soldiers sheared the wool from their own herds, carded the wool, and spun it into thread and knitted their own sweaters, warm clothing and heavy socks.

Mah Bu Fang was a "local emperor," quite independent from Chiang Kai-shek. He put us up for several days in tents with gorgeous rugs on the ground.

Also out in the northwest, the Communists had established many hundreds of small industries of all kinds to give to the

WCL: people some of the things they were denied from industrial cities at the coast. Ruay Ally was in charge of this fine work and I complimented him on his remarkable achievement.

Chali: Then I understand you are now on your way back into China after your Tibetan visit?

WCL: Yes, and I realized that we were being spied on by both sides. The Chiang Kai-shek group were interested to see that we did not favor the Communists, and the Communists feared we might be spies for the central government, so we had to walk a tightrope, so to speak.

The Communists were already well established in the northwest. My secretary, Feng Chao Lin, who kept track of all pictures I took and went with me, used the occasions when we were off alone together to tell me the "inside dope" which showed how we were being watched by both sides in the political picture.

Recommendations for Pilot Projects Denied by the American Government

WCL: Our return to Chungking was rapid. I had sent back to the States my rolls of colored pictures, and had the State Department process them and return them immediately by pouch to Chungking. So when I returned they were awaiting me. I was told that I was the first and only one to illustrate a report to the Executive Yuan (similar to our Cabinet) and they were delighted. I also prepared my report and set forth my recommendations.

The Executive Yuan were most enthusiastic to have my proposals carried out. We had scouted and located places for twenty-two pilot projects that would cost about twenty million dollars. They would require roads being built to them, much farm machinery, irrigation systems, and workshops to repair equipment.

Dams were needed and nurseries started for special leguminous crops and trees. Each would be a pilot project for a large surrounding area that, at long last, would lift the farmers in this drought-ridden region out of their centuries of neglect and help these courageous and proud people into a better way of life.

The farmers demonstrated their responsiveness and appreciation to me by an elaborate farewell ceremony. If these projects had been developed, they might never have turned to Communism.

of eroding areas with suitable growth of grass and trees for fuel and timber, (3) measures to increase intake of rain by soils under farming, pasture and woodlots, (4) measures to control silt by permanent check dams, soil-saving dams, and stream bank protection, (5) measures to adjust farming practices to variability of rainfall, and (6) measures to increase tree crops to tide farmers over dry seasons, and in other ways to safeguard the national heritage in the soil and to increase efficiency of farmers in production to increase their purchasing power to support industrialization, and to enlist the farmers in such a program.

3. That this program be divided into two periods: (I) For the present war, and (2) for post-war. During the war period steps are to be taken to prepare for a comprehensive program of land, water, grass and forest conservation for the period of reconstruction.

4. That for the war period the following steps be taken:

   a. Continue present experimental demonstration projects at Tien Shui and Coa Chiao, and establish one more in the Tao River drainage.

   b. Decide upon most suitable species of grasses, leguminous herbs and shrubs, and trees for general revegetation of gullies.

   c. Establish nurseries for the growing of seeds of such selected species in great volume - by the thousands of catties to be used after the war in airplane reseeding with pellets of fertilized clay as set forth above.

   d. Evaluate farmer practice in problem areas of the Lo Ho, King Ho, middle Wei Valley, Upper Wei Valley, Tao No Valley, Hwang Shui Valley, and Lanchow section of the Yellow River.

   e. Test farmer practices, on demonstration projects.

   f. Provide for training of well prepared men for making maps from aerial photographs to be made as recommended following the war.

   g. Control gullies of moderate size on project area by diversion of water

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From "Preliminary Report to the Executive Yuan, Government of China on Findings of a Survey of a Portion of the Northwest for a Program of Soil, Water, and Forest Conservation," by Walter Lowdermilk.

WCL: It was agreed that I was to return to the United States to prepare lists of equipment and instruments required for these pilot projects. For some time I worked with the ambassador, Hu Shih, in the United States and developed a program to carry out the measures. This I submitted to the White House through channels.

Official American Attitude Toward Aid to China

WCL: Time passed and I heard nothing. I kept up inquiry to find the status of the requests. Finally, it was reported back to me that our project had not been approved. It was our own agricultural attache, Mr. Dawson, who had vetoed it.

I was told he had said, "The United States government is not interested in doing this sort of thing for Chinese farmers. All we are interested in is getting from China tung oil, raw silk, tea and hog bristles."

Thus, our government, not the Chinese, allowed to fall apart this constructive collaboration between our two countries, because we were only interested in what we wanted to get from China, not what we could give to benefit China. We even refused to sell to China our improved tobacco and cotton seeds for fear they would become our competitors. What would twenty million dollars have been, compared to the billions we spend today fighting Communism?

So the farmers of the great northwest, who were so hopeful for what we would do, were disappointed and turned to Communism.

Chall: You must have been heartsick to have been successful with the Chinese farmers but to have lost the victory because of the attitudes of our diplomatic officials.

WCL: How many times I have pondered about our government's action. Why did they send us over there to arouse hopes on the part of the Chinese farmers, that at last help for them was coming, and then cut down on our time, our facilities to do constructive work, and refuse the financial support for our permanent pilot projects?

Goss, our ambassador there, and our diplomatic representatives of course did not speak Chinese. They appeared to have no conception of problems facing these farmers in arid northwest

EQUIPPING AND STAFFING EXPERIMENTAL DEMONSTRATION PROJECTS IN SOIL, WATER AND FOREST CONSERVATION FOR CHINA*

W. C. Lowdermilk
(Honorary Adviser to the Executive Yuan)

Agriculture in China, as in every country, is the basic industry. Agriculture supports divisions of labor of industry, transportation, and services. Food enough for all is the first need in the livelihood of the people. Improved agricultural production to support industrialization, toward which China is now working, calls for three efficiencies in the use of land. They are (1) crop efficiency, (2) land efficiency, and (3) farmer efficiency.

The first, crop efficiency, calls for crop improvement by plant selection and breeding, to develop higher yielding strains that are also resistant to plant diseases. Chinese farmers of forty centuries had improved many strains of crops and fruits by slow and costly trial and error without the benefit of modern science. In the past three decades, however, agricultural scientists by controlled experiments have speeded up improvement of wheat, rice, cotton, kaoliang, millets, and other crops. This necessary work is being advanced as rapidly as possible with notable successes, but with much more to be done.

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*This is a supplement to the preliminary report to the Executive Yuan on November 26, 1943.

Instruments to measure rainfall, run-off, and other factors of weather needed in designing measures and practices for a problem area in soil, water, and forest conservation.

	Shipping Wt.	Ship Tons Each	Ship Tons Total	Est. Price Each	No. Needed	Total
Rain Gages						
Recording	8 cu. ft.	.2	0.6	$65.00	3	$195.00
Standard	4 " "	.1	0.5	9.00	5	45.00
H. Flumes 1.0 Ft.*	10 " "	.25	1.75	50.00	10	500.00
H. Flumes 2.0 ft.*	15 " "	.35	.95	75.00	5	375.00
FR-1 Water level recorders	1.5 "	.04	.60	65.00	15	975.00
Hygrothermograph	30 lbs.	0.015	0.015	155.00	1	155.00
Soil thermograph - double	30 "	0.015	0.015	155.00	1	155.00
Maximum, Minimum Thermometers	12 "			18.00	2	36.00
Sling Paychrometer wall mounting	3 "			14.00	1	14.00
Aenomenter	20 "			(100.00)	1	100.00
Evaporation Pan Weather Bureau Pattern	50 "			25.00	1	25.00
Multi-slot Geib divisors	4 cu. ft.	0.1	2.0	(50.00)	10	500.00
Galvanized iron collectors 1.5 m.d. x 1.5 m. high		0.5	10.0	37.00	20	750.00
Current meter, Gourley Price complete w.1 rev. head #1606, 5 rev. head #1883, 43' cable & rod, with 10 15 lb. weights	5 cu. ft.			250.00		250.00
						$4,075.00

* See attached booklet of drawings and specifications - SCS tp-51, July 1943 - revised October 1944.

WCL: China. The few millions we were asking for the twenty-two pilot projects were infinitesimal compared to the ultimate benefits for millions of Chinese.

The pattern our American diplomats seemed to be following was to continue with the status quo and not venture into new fields. This was so unlike our American concepts for ourselves. They were not interested in the farmers and the little people of China. They did not grasp what I was trying to do for northwest China.

We had a tremendous opportunity and if we had been given the chance, we would have transformed the whole landscape and perhaps prevented Communism from over-running the area. The Communists promised the farmer help, while we had encouraged the farmers of the area and then failed them.

The Chinese Farmer: An Evaluation

Chall: Before we leave the subject of China, would you give your appraisal of the Chinese farmer?

WCL: Well, after spending altogether seven years studying the Chinese farmer and his methods of making lands grow food continuously for four thousand years, I have great respect for the Chinese farmer and give him credit for the monumental work millions of them have done over centuries of time to save their lands from erosion and to maintain them in permanent production.

They have demonstrated a love of the land by the way they have struggled to save and protect it. Sloping lands leveled for rice fields to hold water are a magnificent achievement. Their works of bench terracing, without scientific instruments or the benefit of scholars and scientists in many parts of northwest China, demonstrate a native intelligence and supreme effort that commands our admiration.

The dikes they have built ever higher and higher on the lowlands, to protect their lands from floods, requiring the organized labor of millions of farmers over hundreds of years is a tremendous achievement. Their ability to use what native fertilizer is available to maintain the fertility of the soil for production of one, two and three crops a year over centuries of time on the same farm fields gives us great respect for this traditional knowledge.

WCL: These farmers of forty centuries have produced the same crops on the same fields because of their methods of utilizing night soil. No fertilizers were available except from farm and city peoples, and this was cherished and ripened, then carried in buckets on carrying poles and put on or around each individual plant in the field.

Thus China has survived through the centuries on what we waste and pour out to pollute our rivers and sometimes our beaches. China would have committed national suicide centuries ago had she followed our wasteful methods.

I have come to certain conclusions regarding the Chinese farmer. First, he is reverent. He knows he must rely on a power greater than his own for his crop. On each field he has a tiny earth temple where he burns incense and entreats Heaven to help him produce a good crop. But he joins with Heaven by contributing his labors from morning until night.

Second, the Chinese farmer is independent. He is an individualist. He has learned the hard way that there is no one to help him but himself, for he has never had assistance from the government, not at least before the present regime, nor from scholars, to help him in scientific and technical matters.

Third, the Chinese farmer is industrious. He cheerfully works from dawn to dusk, wringing from nature her scanty gifts by ever more arduous labor. When nature sends starvation by drought or destruction by flood, he returns to the land, begins again and never gives up his love for his land. The Chinese farmer may have been forced into communal cooperatives by Communism, but I have the feeling that he is only biding his time to return to his old individualism and love for and pride in his own land.

Fourth, the Chinese farmer is intelligent. For some reason, officials of old countries, whether Far East or Near East, have looked down on the farmer through the ages and thought of him as ignorant. But I have found that he is fundamentally intelligent.

He has absorbed much traditional knowledge and uses it in his farming practices. He makes the best of inadequate equipment. Bamboo is most useful as the Chinese farmer's best friend. It is astonishing to learn the many uses the farmer makes of his bamboo woodlot in his farm yard. The Chinese have an expression "Giang Ju," which means "Think of a way," or "Adapt what you have." Somehow the Chinese farmer is intelligent to use what he has available to do what has to be done.

China will soon be a nation of a billion people. It is largely a land of farmers. They, in some ways, are the best farmers in the world, for they have maintained their land longer

WCL: than other peoples and fed more people per square mile than other farmers of the world. They have suffered an over-abundance of people and an under-abundance of land.

Now the Chinese farmers have an even greater challenge and responsibility to feed their exploding populations. Without the incentive of maximum production on their own land, assisted with better seeds and implements by the government, and diversions for more water for irrigation, the Chinese will not be able to meet this challenge, in my opinion. The Chinese farmer otherwise cannot be forced to produce on communal lands.

To me, the Chinese farmer belongs to the soil which has absorbed the ashes of his ancestors for forty centuries. He loves the Good Earth and has been diligent to do what he knows to take care of it. He has had little animal power, except for the few in the south and west who could afford a water buffalo, and in the north, the small oxen or yellow cow. For the land that would feed one animal could supply food for several human beings.

He has had no mechanical power at all. So the Chinese farmer has often had to be his own "draft power" to till the fields by his own muscle and sweat. It is astonishing that he has done the job of growing food as well as he has.

So, in many parts of China I have evaluated the work of Chinese farmers, their trial and error methods, their successes and failures wherein some ingenuous farmer has solved the agricultural problems of the region in whole or in part.

I feel that it has been one of the privileges of my life to have thus had an intimate acquaintance with the Chinese farmer for whom I have the greatest respect.

TRAVELS ABROAD WHILE ASSISTANT CHIEF OF THE
SOIL CONSERVATION SERVICE

Part 2 Return to China, 1942-1944

[Taped questions and answers]

The Chinese Staff

Chall: I understand that on this second trip all but one of the associates assigned to you had worked with you before. What had those men been doing in the intervening years? Had they been working in soil erosion or forestry or agriculture?

WCL: Well, many of them had been teaching, for there was a great demand for them. They couldn't go back to their own lands as farmers, because the income would not support them. They had all taken jobs in some educational institution.

It was unfortunate they were not able to carry on the profession they had learned. There wasn't money to launch large-scale projects in China at this time. Usually it was quite common for an educated man in China to have several jobs. His energies and his interests were divided so no job was well done.

Chall: I see. So when you got back, was it almost like starting all over again?

WCL: No, for these men had kept up their interest in our type of work. And the loyalty of these young fellows was really touching.

Instructions to Staff

WCL: In working with my staff, I set up an objective, to evaluate farmer practice. I said, "These farmers have been farming this land for several thousand years, and they've built up traditional knowledge based on trial and error from times past. They have

WCL: learned what to do, but their explanations do not sound very reasonable to a man trained in modern sciences, such as physics, chemistry and biology."

The tendency of the scientist had been to say, "Well, these farmers don't know the facts, they're old-fashioned, so we'll discard this past knowledge and start anew."

But I insisted, "This traditional knowledge is based on long experience, and if we can separate their explanations from what they've been doing, then we have much to learn from these farmers."

So I always honored their traditional knowledge and took occasion to praise the Chinese farmer for what he had done. And I said, "All we need now is to collaborate. We'll take these measures that have worked out, and we'll use our scientific procedures--surveying, exact levels that we want, and so on."

Developing Engineering Plans

WCL: We would, for example, engineer the contour. The trouble was, the Chinese terraces were not engineered in northwest China; their slopes were steep and water would flow off too rapidly and consequently cut deeply into this loess soil, which is very susceptible to erosion. It's tremendously fertile material but it also presents a very difficult problem to cultivate and control erosion.

Chall: How would you prepare your engineering plans?

WCL: We would survey the areas and make a topographic map of it. Then we would put this map on the drawing table and work out the slope.

For instance, if there was a heavy rain, we would go out on these slopes and note very carefully where the runoff started and also note the angle of the slope. That gave us an indication of rain runoff from different slopes at different distances. This gave us preliminary data that was very important in making designs.

My engineer, Y. H. Djang, an agricultural engineer, wanted to be a scholar. He said to me, "You get the facts and I'll make the design here in the office." I said, "But I want you to get out in the field and apply your design to the local situation." He preferred desk work then but now he works in the field.

Chall: I see. That's the old custom of doing no manual work that you

Chall: found years before among scholars.

WCL: Yes, it's hard to overcome long tradition. We would lay out the plans and then put terraces on the contour.

Working With the Farmers

Chall: Then you worked with the Chinese farmer by the old methods of shovel, plow and cow?

WCL: We had to use what means we had at hand available to the farmer. In some areas we had horses but cows were the draught animals. We had no powered implements. The Chinese farmer doesn't see any need to hurry because things don't hurry in China.

Chall: How did you arrange to work with the farmer?

WCL: Of course we had to have the government working with us on this. We would rent land from the farmers themselves or from villagers, and then we would employ the farmers to help us put in the measures that we wanted. The landlord would be paid a certain fee which would be more or less equivalent to his rental that he got from his tenant farmers.

We guaranteed we wouldn't destroy anything, because we had to gain the confidence of the people. We had to show them what we were doing, and they watched our every move.

Chall: Did they understand what was happening in terms of gullying and the resulting loss of their land?

WCL: Well, as an example of how they felt, one day in early evening a group of farmers came and talked to members of my staff and to me. They wanted us to prepare their land in the same way as we were doing on our pilot area.

I said, "This is really fine. I consider the approval of these farmers more important than the approval of the officials in Chungking, the capital."

Years later, after the Communists had come and taken over, we were delighted to hear that our farmers were still farming this first area with our new methods.

Pebble Mulching

Chall: What about pebble mulching you mentioned?

WCL: We found pebble mulching already in operation in Lanchow, Kansu Province, in an alluvial valley of the upper Yellow River tributary which covered an area of about thirty by one hundred miles. We do not yet fully understand this mysterious process.

Here, farmers go to the river beds that have been covered up with finer soil and dig down through the alluvial fill to this layer of gravel which the stream had piled up here and there. The farmer carried up this gravel and covered his land about six or eight inches deep, which he had dug up from about five feet below the surface. He then used this land to grow squash, grapes and crops of that kind.

Because of this pebble mulch, the yields were greater than where it was not used. We asked if they knew how this idea originated.

They said tradition was that when a farmer worked hard covering his land with this pebble mulch, then his son and his grandson would have an easy life with little work to do, yet the crops would be good.

After some years, these pebbles become encased in sort of muddy soil, and they were no longer beneficial. I said, "Why not wash them off?"

"Oh, that wouldn't do," they said. "The farmer must go and take the old pebbles away and dig fresh ones."

Chall: That was such a job to get the pebbles there in the first place. Did you convince them to try to wash them?

WCL: No, but we started some experiments. We hired a man trained in experimental agriculture, named Edwards. We wanted to find out about the effect of pebbles on temperature. It may be these pebbles keep the soil warm during cold nights at this high elevation.

The sun would heat up the ground during the daytime. Apparently these pebbles helped the rate of growth of these crops and accounted for higher yields than they were getting where they didn't use the pebbles.

Also, we felt the soil moisture was improved and evaporation was not so heavy. But pebble mulching wasn't something we could recommend because of the heavy hand work involved. More research

WCL: would be needed. The Chinese farmer doesn't hesitate to work hard if he knows he can get results.

Revegetation of Gullies

Chall: What about your plan to revegetate gully slopes?

WCL: We hoped to have natural vegetation take over again where annual rainfall is sufficient. But unless we can get some substitute for wood or fuel, it is difficult to get the plan to succeed.

In Shansi Province, coal is as common as stone. Just dig away a little of the old weathered coal on the surface, and there are layers of the finest of hard coal.

Chall: Did they understand the use of coal?

WCL: Oh, the Chinese knew what coal was good for, but at that time they didn't have the machinery or factories that required coal-burning for steam.

Apparently, now the Communists have industrialized this area and are using this high-grade coal of Shansi Province. One needs transportation to get this fuel where it can be used without too much expense.

Roads

Chall: Was there much improvement in the roads, from your expeditions into the north during the 1920's and your later survey in 1942-43?

WCL: There was a very big improvement. O. J. Todd, my colleague on some of my first trips, was the chief engineer on the International Famine and Relief Commission. He was the one who worked out plans as a work relief measure to build dikes, roads and highways.

He worked out the plans for an enormous number of Chinese on relief roles to build the road north from Chengtu, the capital

WCL: of Szechwan Province over the Ting Ling Shan mountain range to Sianfu, the capital of Shenshi Province. This very steep mountain range is known as the natural wall of China, dividing the north from the south.

This mountain road construction was a spectacular engineering feat, with its switchbacks up and down both sides of this steep mountain massif.

TRAVELS ABROAD WHILE ASSISTANT CHIEF OF THE
SOIL CONSERVATION SERVICE

Part 3 Study of Erosion in Paricutin, Mexico, 1945

Chall: I believe it was during your last years with the Soil Conservation Service that you went on an assignment to Mexico. Who sent you and why did you go?

WCL: I was invited by Dr. Richard E. Fuller, chairman of the National Research Council of the United States, to lead a group to Paricutin, Mexico, and collaborate with senior engineer Patiño, director of the Mexican Soil Conservation Service, in a study of erosion in volcanic ash laid down around the still erupting volcano at Paricutin.

Our party included Reed Bailey, a specialist in erosion from Ogden, Utah, and my college-age daughter, Westher Lowdermilk. Patiño appointed two young engineers, Senor Navarro and Senor Llerena, to carry on field work with us.

We went in summer, 1945, and stayed two and a half months. This experience was an unusual one for me and one of great scientific interest. I should like to tell you some of the details.

Origin of the Volcano

WCL: Volcanoes are a common part of our geological history, as known by the countless evidences of extinct volcanic cones and lava flows. The very special feature of this volcano at Paricutin was that for the first time in history, scientists had witnessed the birth of a new volcano and had followed the processes of growth from its very raw beginnings to its complete cone.

The venerable geologist of Mexico, Dr. E. Ordonez, had followed the eruption closely from its second day, along with local villagers and two members of the Mexican Soil Conservation

WCL: Service. They told details of the birth of this volcano that was still putting on fiery demonstrations for us two years later.

In February, 1943, an Indian corn farmer named Polido, and his wife, were working in their corn field. There had been violent warning earthquakes that are common here, so the Polidos went about their work as usual. Suddenly, while they were at one end of the field, the center of the field sank; great fissures poured out smoke and steam. The frightened farmer fled in terror, but his wife, with a woman's curiosity, stayed and looked on, fascinated, to see what would happen next.

Suddenly, violent eruptions of smoke and fire shot skyward, throwing out volcanic bombs that fell nearby and began to build up a cone rapidly. It eventually climbed to a height of fifteen hundred feet in ten months. Fine-grained volcanic ash was caught up in columns of violently rolling, turbulent clouds.

As these clouds cooled off, ash rained down over the countryside. Some ash fell about two hundred miles away in Mexico City. But near the volcano, the ash layer increased in depth rapidly to ten to twenty feet, while further away from the cone, thickness of ash became less and less until finally it disappeared.

Lava, as a grayish, moving mass of thick, crackling, crumbling rock, issued forth from openings near the growing cone. As flakes of rock fell away from the "front," glowing red showed forth in the awesome glow.

Slowly but inexorably, this graying, diabolical river of molten rock moved down the newly-built slopes. It spread and enveloped trees of the forest and all but the tower of the village church at San Juan. The village of Paricutin was entirely covered with blackened, jagged masses of lava, and lost to view.

Of course, this spectacular exhibition was an exciting experience to see, not only for scientists, but for great numbers of inhabitants and tourists. The spotlight was turned on the farmer and his wife, owners of the field. They became the center of great interest, as eyewitnesses of this historic birth of a volcano.

The terrified farmer who had fled the scene embellished what his wife saw as his own experience, into a vivid, colorful story. Only when he was drunk were the descriptions of what he saw reliable reports of what took place in his corn field.

Experiences at Survey Headquarters

WCL: We slept in a little asbestos house about three miles from the cone, but during the day, we were often in our little wooden observation shelter close to the volcano in order to have an intimate acquaintance with its changing moods.

One day when Paricutin was especially quiet, my daughter, Westher, and the two young Mexican engineers, decided they wanted to climb Paricutin and peer into the inside of the cone. I objected, but when Westher begged, "Daddy, if you were my age, wouldn't you want to see what it looks like inside the cone?" I succumbed.

When they were about halfway to the top, suddenly Paricutin began to rumble and shake and spew out great bombs of molten rock which became boulders, bouncing down the side of the cone. The young folks did not need to be told to come back--they were hot-footing it down the cone at top speed.

At the bottom lay one of the new boulders that had traveled faster than they. One of the engineers wanting to see whether it had cooled while being hurled aloft touched his finger to the boulder. Immediately the end of his finger was deeply burned. They never again tried to look into the cone or test the heat of newly-made boulders.

At the time of our study in the summer of 1945, Paricutin was only intermittently explosive. But at times, the volcano put on a great show for us. Frequently at night, great roars or bursts from the cone would awaken us and we looked out upon a hellish display of incandescent "fire and brimstone."

Great blasts of gas and streams of glowing volcanic bombs were shot high into the air. These formed fiery arcs as they showered down, some back into the cone to be ground into fine-textured ash, while others fell outside to roll down the slope as fiery runoff. We seemed to be reviewing the making of a new world.

Here at Paricutin were unleashed forces of many kinds--physical, chemical and electronic. Lightning flashes from time to time lighted up rolling turbulent columns of ash-laden vapors. The earth's surface quivered in its spasms of eruptions of tremendous jets of gas and rumblings of deep-seated explosions.

Organizing the Study

WCL: Our party was interested primarily in the dynamics of the spectacular erosion that was occurring in the covering of volcanic ash spread by the volcano. I can only give you a general idea and description of erosion of ash and some of its consequences locally, and down in the Los Reyes valley about twenty-five miles away from where we made our detailed studies of runoff and mud flows from the volcano area.

Nowhere have I seen all kinds of erosion so fantastically demonstrated as in the ash deposits about the volcano. Sheet, rill and gully erosion, stream capture, mass movement, mud flows, sapping, colluvial and wind erosion--all these forms in miniature and in large, we found in hundreds and thousands of examples.

Chall: I can understand what an experience this would be to an erosion specialist. How did you go about your studies here?

WCL: First, we sized up our problem and decided on a special study of the volcanic ash in the eliptical area of greatest ash deposits, resulting from prevailing winds. This area had a fifteen mile east-west axis and a north-south axis of about nine miles.

Here ash depths varied from about eight inches near the outer margin to ten to twenty feet or more near the volcano. Then we chose certain areas where we would run transects for taking samples and detailed studies.

We found the new ash was deposited in layers. We observed twenty distinct layers in one three-foot cross section. The layers of the new ash conformed to the configuration of the old land surface as a gray blanket draped over the existing topographical features of slopes and valleys. All deposits were distinctly stratified and varied in thickness from a trace to several inches; textures varied from fragments the size of cinders to fine ash dust.

In the gaseous clouds were suspended vast quantities of very fine ash. During the frequent summer rains, this fine ash was caught in falling rain and laid down in a compact layer over former deposits of ash and cinders. This happened over and over again and accounted for the unusual stratification which we found everywhere near the volcano.

From the beginning of the eruption, and during our field work, volcanic ash fell on the countryside as heavy black-gray snow that would not melt. It overturned trees and broke the brittle branches and bent others over to the ground. Forests

WCL: nearby were heavily damaged. Grass was smothered, depriving livestock and game of forage. Farm fields that made up about thirty percent of the land area and lay chiefly in valley floors were covered to depths that stopped the growing of the usual crop of corn.

Reaction of Villagers

WCL: Of course, villagers of Paricutin and San Juan had to flee for their lives lest the lava flows engulf them. But villagers from adjoining farms, although temporarily ruined by ash, refused to leave.

Volcanic ash, as you may know, is one of the best of soil conditioners. Lava and ash are derived from an olivine basalt of the volcano and contain a good store of elements (except nitrogen) required in a fertile soil. As soon as the ash weathers enough to release fresh supplies of plant nutrients, it can be looked upon as a blessing.

We found that when ash is not too deep, it does little damage, and in fact is beneficial to growing crops. Villagers at Zirosto and some other villages told us that where they could plow through the ash cover into the underlying soil and turn it on top, their crops were greater, that wheat yields were threefold those before the eruption. The ash, when not too deep, may serve as a mulch that increases rain intake and reduces surface evaporation.

Because of this promise for the future, most villagers refused to leave their homes, even though the government of Mexico offered to resettle them. Most of their lands were too deeply covered with ash to turn with horse plows, so these sturdy farmers hoped for tractors, to pull larger plows that would go deep enough to mix the ash with the natural soils.

So they remained hopefully, even though they had to slaughter their animals or drive them away, for there was no forage. The bees had been killed and their fruit crops were very poor. Loss of their sugar cane crops closed the refinery.

The lot of the people was tragic, but they refused resettlement because they loved their land, and they knew that sooner or later the troublesome ash would make their crops bigger and better.

Studies of Erosion in Volcanic Ash

WCL: The hydrology of the area had been much changed by the deposit of ash. Some suggested that the apparent increase in runoff was due to the juvenile or magmatic waters that shot forth in the eruptions of the volcano in the gaseous clouds.

The famous Mexican geologist, Dr. E. Ordonez, estimated the eruption was equivalent to a stream of water, running thirty-five cubic feet a second. This is new water out of molten rock that sees the light of day for the first time and is added to the sum total of the earth's store of waters. But this addition to regular rainfall was not enough to account for the enormously accelerated erosion in the ash.

Here at Paricutin, we could study the simple, uncomplicated responses of erosion to natural laws. Heretofore, when dealing with erosion of soils with natural vegetation on the ground, our measures of control had been complicated or modified by the natural vegetation.

It was interesting to find examples here of erosion in volcanic ash in simplest terms in the layers of volcanic ash. We saw hundreds of thousands of examples.

We could watch the phenomenon of rilling and gullying: when rain fell faster than infiltration rates at the surface, unabsorbed storm waters gathered in rills that came together in larger and larger rills or streams that cut deep into the ash, or through it, into the old soil surface, and then continued to gully out the original soil into far deeper gullies than formerly.

We gave special attention to runoff that cut deeply into the forest-covered lands. Where needles fell onto the ash, even if dry, they sealed over the ash sufficiently to prevent erosion; but where the ash was exposed, erosion was accelerated, often reaching deep into the sub-soil.

We also were able to study wind erosion. For as the ash dried, it was exceedingly susceptible to wind erosion. At such times, there were strong whirlwinds that moved the ash about over the surface of the ash-covered landscape.

Floods and Mud Flows

WCL: We took every opportunity to observe and to sample storm runoff

WCL: and its burden of ash. On one such day, west of Zirosto village, we saw in the distance a torrential rain falling in the ash-covered mountains. We saw the large flood that came down the stream channel.

The angry flood waters were steely black and flowed as a heavy liquid but without foam. We watched and photographed a standing wave ten to fifteen feet high. So powerful was this flood flow that the banks quivered under impacts of the swirling current.

The waters carried suspended loads of 64-65 percent by weight, not by volume, according to our samples, and had a density approaching 1.8 or nearly twice the density of water.

These flows had damaging effects in lower lying agricultural lands, on outwash fans and valley floors. We made a trip of three days by horseback into the Los Reyes area to investigate effects of floods draining the volcanic slopes of Paricutin.

At first, canals and ditches were choked with ash deposits. It was a costly and difficult task to keep them open. Next, the diversion dam had been washed out and irrigation waters were drained away. Several millions of dollars had already been lost as a result of floods out of the ash-covered mountains.

Boulders

WCL: These flood waters, heavily charged with ash, brought down and floated out great boulders upon good farm land in the valley. We were able to study three typical mud flows.

In one, an analysis showed the ratios of solids to liquids to be 70-75 percent. Another had a specific gravity of approximately 2. A mud flow a mile and a half west of Paricutin, heavily loaded with ash, carried boulders which measured up to four feet across out onto an outwash fan with a gradient of five percent.

Some large boulders were left resting on top of the mud flow when it stopped, with no evidence of their having been exposed by erosion. Of course some boulders were found buried in the ash deposits.

We saw another mud flow carrying boulders two feet in diameter over an outwash fan with gradient of less than two percent. The rate of movement was a slow walk, and the consistency of flow was that of a thick mortar.

Main floods that surged down the channels to the irrigation works at Los Reyes, twenty-five miles away from the volcano, could

WCL: not accurately be called mud flows, although they carried large quantities of ash--they were distinctly heavy ash-laden water flows.

We found that the ash lacked cohesive materials and had a single grain structure. Thus surface flows quickly picked up capacity loads of ash which cut rills and gullies, and these streams, when armed with ash, were abrasive agents cutting and carrying material of the ash layer and digging down into the underlying soil.

Summary of Study

Chall: You imply that this study of "erosion in the raw," as you call it, has added considerably to the sum-total of your findings about natural and man-induced erosion.

WCL: Yes, for me it was an interesting experience. Studying erosion in the raw here furnished opportunities to study phases of the dynamics of erosional processes that are operating at much slower rates in unaffected landscapes. For here we found in these erosional phenomena in the mantle of ash spread by the volcano, the full range of processes of land sculpture.

Erosion and storm runoff are accelerated. Eroded ash is washed out into valleys. Flood flows cut deep gullies through alluvial fills and carry great amounts down stream to shoal streams and to damage lands below.

We were able to observe all these phenomena in many forms, in a limited area and in rapid development that would ordinarily be impossible.

While the fall of this volcanic ash had a damaging effect in smothering out crops and vegetation, and in accelerating erosion from slopes where ash fall was heavy, there were expected to be beneficial effects in the end.

Ash, being excellent soil material, would in time make the lands more productive. By applying principles and measures of physiographic engineering and conservation farming, damaging effects of the ash could soon be brought under control.

But lava flows, in their formidable, jagged black mass, are an entirely different story, for it will take a geologic

WCL: age for lava to weather. Land covered by lava cannot be used for a long,long time.

Publications

Chall: Have you written reports of your studies at Paricutin?

WCL: Yes. Being leader of the study group, I drafted a preliminary report and sent it to Reed Bailey for his concurrence and amplification, and to the engineers of Mexico. Then I wrote a forty-five page report, entitled "Certain Effects of Ash on Hydrology of the Paricutin Volcano," and sent it to Dr. Fuller. Also I had a publication in the Soil Conservation magazine,* and another in The Bulletin of the Pan American Union, with Reed Bailey as co-author.**

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*"A Look at Paracutin," Soil Conservation, June-July, 1946.

**"A Look at Paricutin," August, 1946, pp. 442-50.

X CONSULTANT TO GOVERNMENTS IN FRENCH NORTH AFRICA

[Written questions and answers]

Chall: What was your first overseas appointment after retiring from the Soil Conservation Service, and how did it come about?

WCL: This appointment was to go to French North Africa to consult with Protectorate Government officials on causes and damage of soil erosion, storm runoff, transport and deposits of eroded material; and to advise on what necessary measures must be taken for conservation on farm lands, pasture lands, and forests as they include irrigation and land drainage. They wished to have the benefit of my experience in the soil and water conservation movement in the United States.

I went under the auspices of what is called NEYERPIC, with headquarters in Grenoble, France. The branch operating in North Africa was called GETIM. Mrs. Lowdermilk and I left the United States in March, 1948, and returned in August, 1948.

French Protectorate Officials

WCL: To begin with, I want to say that I have great admiration for and appreciation of the French Protectorate officials and technicians in the field, for their kindness and efficiency. I was favorably impressed with the high character of these exceptionally well-trained men and their determination to go ahead with practical solutions to their many problems in this new, old land.

Chall: Had you known some of these French officials previously?

WCL: Yes, this first job as a consultant had an interesting background. On the 1938-39 trip across old lands to see what we could learn for the benefit of our own stockmen and farmers, I had gone to the famous hydraulic laboratory in Grenoble, France, headed by a genius named Pierre Danel.

I was fascinated by his many unique inventions--one, a measuring device for irrigation weirs; another, a process to make pre-stressed concrete pipes, which method is now used around the world. He designed dams that swept out accumulating silt and

WCL: reduced silting of reservoirs, and he had many other clever and new ideas.

He too was interested in my work and wanted to get in on irrigation works I might suggest. He had sent a brilliant young engineer, named Chadenet, with me to Africa to show me their work and in turn, to learn where they could cooperate.

His organization was called GETIM in North Africa. The French old-line bureaus with their red tape had become quite ineffective, so the French government adopted quasi-public corporations to study, to plan and to carry out works.

Ten years later, in 1948, Danel and his GETIM in French North Africa, who were now doing numerous large dams and construction works, invited me to be a consultant on their land and water problems. This proved to be a most interesting experience.

Morocco

Chall: In what Protectorate did you begin your work?

WCL: We went immediately to Morocco, where for several months we were to see the impact of thirty-five years of the French Protectorate: a modern western civilization with technology and power, working on a worn-out, medieval society. Here we saw the action and reaction between the decadent old and the progressive new, with results that could produce a new day for this remarkable part of old Roman North Africa. The Moroccans had been left in a backwash, as western civilization moved out of Europe and on to the Americas, until 1912 when the able administration of Marshall Lyautey took over.

I almost felt at times that I was in California. Morocco is a third larger than California and is strikingly similar in climate, topography and crops. Both areas have more land than they have water to irrigate them, so here too water is the limiting factor.

But California was a pristine country, while Morocco had been badly damaged over centuries of time by overgrazing, deforestation and man-accelerated erosion, under the fatalism of the Arabs. What a beautiful country it must have been under the Carthaginians and the Romans.

Goat Culture

WCL: The villain in the tragic story of land destruction in Morocco, and elsewhere in Arab lands, is the goat--the black, four-footed, cloven-hoofed, flop-eared "locust" which has been and still is the scourge of the land.

If Mohammed had forbidden his followers to eat mutton instead of pork, soil erosion would not have created man-made deserts as it has done. As one French official said, "The Arabs make a moon of the earth." We found it impossible to find any original vegetation. Nothing is sacred, not even burial grounds.

Little vegetation escapes the devastation of goats except cactus, unedible weeds and a few plants that can re-seed themselves beneath the spiny cactus. The French had begun to plant a cover of cactus on contours to prevent erosion and to bring back some vegetation on the ranges.

But I thought many times, "What a travesty in the use of land, when its principal hope of restoration is the despised cactus." Re-seeding palatable plants under cactus spines is made possible in this way. Now a spineless variety of cactus for the poor soils is being developed to increase the food supply for herds.

The prevailing diet of local people lacks Vitamin C. This is supplied in the cactus fruit each summer. But cactus fruit is lacking in protein, so the French planned to plant some species rich in protein.

The nomads and small farmers put their wealth in herds, and never in banks. This resulted in overstocking the range in good years and death by starvation in droughts. Three years before my trip, eighty percent of herds had died of starvation. As the French said, "The nomads' sheep bank had collapsed and gone bankrupt."

Mohammed had decreed: "That which dies of itself shall not be eaten." They did not seem to realize their animals were starving to death and would not slaughter them. We were told that the sheep and goat population of Morocco was several million more than the number of human population.

We never traveled any distance in the interior without meeting herds either enroute to pasture or enroute home for the night. It was startling to round a corner on a dark night and be confronted by scores of pairs of sheep's eye "flash lights," as they gazed from the darkness into our headlights. But it was more dangerous to encounter a flock from the rear without "tail lights."

WCL: These herds are a great hazard to themselves as well as to autoists.

Of course, all the villagers and native farmers have herds, but perhaps in the past, the most destructive have been those belonging to the nomads that from untold ages have, in transhumance, gone northward from the desert each spring for summer food and returned in the fall. Formerly they also robbed and looted, but this was stopped by the French, so that, in 1948, these nomads were the migratory laborers of Morocco.

They cut the grain by hand sickle on the old-fashioned farms, or gleaned after harvesters on modern farms. After the grain harvests in July, there were hundreds of thousands of acres of wine grapes ready for harvest. They ripen first furtherest south and the nomads came northward as crops ripened.

Aside from a main diet of dates, the nomads had a habit of storing up Vitamin C, for they could eat all the grapes they wished. A French farmer told us that the first night after picking started, one Bedouin was taken with cramps and died. A postmortem disclosed he had eaten twenty-two pounds of sour wine grapes, seeds and all, which proved too much even for the hardy Bedouin of the Sahara.

The life of the Bedouin was difficult and so was that of the Arab farmer. He followed the farming practices of his forefathers. There had been little improvement of harvesting or thrashing or plowing or fertilization. It was little different from stone age times.

Difficulties Involved in Modernizing Agriculture

Chall: It must have been difficult for the French to try to get native farmers to change over from their old ways.

WCL: Yes indeed--it was exasperating. One day our conservation party was standing on a hill watching the French putting in banquettes, or contour benches on the slope, to prevent the soil from washing down and filling up a reservoir with silt.

A well-dressed landlord, who was also a village official and politician, was complaining bitterly to French officials that this would make the earth harder to cultivate. I called his attention to the wheat crop that was not more than two-fold, because it had been sown in subsoil. I showed him that the soil was entirely gone.

WCL: I explained that these measures were necessary to prevent further destruction of the land and to increase intake of rain to give bigger crops for his village. The Arab official replied, "Why try to keep it from washing away? If it washes, then it is the will of Allah."

Although whatever happens in nature seemed to be accepted as the will of Allah, we did see that they all joined together to try to deter the invasions of locusts that usually come in May and October. It was pathetic to see them with waving branches or rags, trying to drive the crawling hordes into prepared ditches so as to burn them.

When we met these solid masses of crawling creatures on the highways, our auto wheels skidded as if on ice. It was messy. The French had not made much headway with locust control in 1948.

Whatever the French tried to do for the benefit of the people, there were problems. They introduced heavier plows, but native animals were not strong enough to pull them. The animals required more and better food to pull the heavier plows, and the natives said it would not pay, because the animals would eat the extra grain the better plow would make possible--"so why try?"

Some of the natives were eager for irrigation, and French officials were making rapid strides in providing it. Even so, they had to concede to native wishes and there were constant hindrances. We went to see a dam that if built, would cover a spring in which were some fifty sacred turtles.

The French engineers could not put in this great irrigation project until after they had enclosed and sealed the spring with cement and piped the water several miles to the relocated village, so that the sacred turtles might not be inconvenienced by a change in water. When we asked to see the turtles, we were told that the turtles were too sacred for infidel eyes to look upon.

But East and West met here in Morocco, and they were, in 1948, working together. It was slow, but when we realized that all the tremendous advances and improvements had come during the preceding thirty-five years (and the first few years were spent in pacification), we thought there was hope that another thirty years would bring a big change in the native farmer and the Bedouin, unless political changes would disrupt the good works.

French Farmers in Morocco

Chall: You have not yet told of the French farmers who had settled

Chall: in Morocco.

WCL: These French farmers were called Colonials, or Colons. A few carried on farming traditions of France, but most were modern progressive farmers. We were delighted to see how they vied with one another in planting borders of sweet peas along the highways, four to ten feet wide, for miles and miles along their extensive holdings. The sweet peas were for beauty, perfume and for seed to be exported.

Many farms were very large, especially those producing grain crops or wine grapes. While these Colonials formed only a small part of the population, they demonstrated possibilities of modern farming. In most areas, natives had not yet adopted measures and practices of conservation farming.

While the colonial farmers cultivated what appeared to be the best land, for it lay for the most part in the valleys, they generally had not done this at the expense of the indigenous population. These lands they had to reclaim at considerable cost, either by drainage or by clearing off the tough natural vegetation of camelops (dwarf palm).

The French brought in huge tractors and heavy steel tempered plows for deep plowing, to tear out and root up this tough and difficult growth. This land was then ready for farming.

But all Colonials were not farmers. Some French and European colonists had come into French North Africa under French protection and lived in the beautiful modern French towns and cities adjoining the native cities, and were carrying on trade and business.

Franklin Roosevelt's Statement

WCL: President Franklin D. Roosevelt came to Casablanca in January, 1943, during World War II. At that time he made a very disturbing statement, whether because he had been misinformed or whether he wanted to please the Arabs (as is presently being done in the United Nations after the Israeli victory), I do not know.

But we were told that he had stated that the French had usurped the best lands for their own uses and intimated they had neglected the interests of the Arabs. He expressed nothing regarding the expensive and remarkable works that the French had installed to benefit the native populations.

French Provide Benefits to the Population

Chall: What were some of the things the French Protectorate did that especially benefited the native populations?

WCL: All Morocco was safe for travel and was accessible by plane, train, bus or by automobile. Tribal warfare and banditry were no more.

French engineers had built thousands of miles of excellent highways that linked all parts of the country closely together under the tree tunnels of eucalyptus, pepper, acacia, mulberry, olive or fig trees, which gave welcome shade to people and animals from the hot sun. Besides, there were twenty thousand miles of well-marked "pistes," or tracks.

Railroads, run by electricity, opened up the country in all directions, and were replacing age-long camel caravan routes and tedious months of travel on foot or on saddles. The French had opened schools for rich and poor alike, but as yet only a small percentage of children were in school.

The French had piped water into practically every native town and even many small villages. They had even included some swimming pools. To prevent hardship by war shortages, French Posts of Civil Control in each area allowed natives to buy colorful cotton cloth for garments at twenty cents a yard.

Farmers got cash loans without interest, to tide them over until harvest, to be repaid in grain. Each used his thumb print to sign the agreement.

Then too, these Civil Posts had "medicine," or "Clinic Days," and these, along with better sanitation, safe water supply and imported food in time of shortages, had let the population almost treble in thirty-seven years.

This increase in population also had a bad effect, for flocks and herds had to be increased. Damage to the country by overgrazing and forced cultivation on steep slopes was therefore dangerously accelerated.

The French had provided irrigation for the Colonials, and also for the Caids, or village heads. They had allotted water on an equable basis project by project, and plans were being prepared to develop every possible source of water in Morocco.

While we were there, the French were trying out artificial rain making. They waited for the right conditions to seed clouds and bring rain down into an important watershed above one of the

WCL: big new dams, for the reservoir was alarmingly low.

But the results were not what they expected. The deluge came down all right, but the wind swept the clouds beyond the desired watershed and delivered their contents down onto another watershed that flowed uselessly out to sea.

The French Protectorate officials were efficiently taming the rivers, draining the swamps, building dams, and irrigation works, and canals, and were beginning a program to protect the watershed from soil erosion and thereby prevent the dams from silting up. (This I had advised them to do ten years before.) They were contouring the hills in places, and everywhere tearing up the camelops or tough dwarf palm clusters which covered vast areas.

They were protecting what forests remained after centuries of destruction by man and goats, allowing a natural return of vegetation and beginning some reforestation. These French officials were working hard to improve native agriculture against native resistance to change and the fatalism of the Moslem religion.

So as I looked over the vast outlays of expense and hard efficient work of Protectorate officials in Morocco against great odds and frustrations, I felt that President Roosevelt's derogatory remarks about the French, which increased resentment and decreased Arab cooperation, were entirely unjust to the French and their untiring efforts to improve the condition of local peoples.

Winston Churchill preferred vacationing in Marrakesh, down near the Atlas Mountains. He too used his influence to discredit the French and help throw them out later. But misinformation, or efforts to say words that would please the Arabs, do not change my knowledge of, or appreciation for, the fine work of the French Protectorate officials in Morocco.

Field Trips Throughout Morocco

Chall: Were the field trips in Morocco as strenuous as your land use studies generally have been?

WCL: Yes, but they were well planned and carried out in two strenuous field trips involving more than five weeks of actual travel time. Mrs. Lowdermilk and I traveled seven thousand kilometers, and studied fourteen areas of special interest that included all types of land problems: salinization on wide areas near the coast,

WCL: erosion of sloping lands on cultivated and over-grazed hills, forest lands in already over-populated mountain regions, low swampy lands requiring drainage, heavy clay soils, dry farming, irrigation, reclamation of sand dunes, silting of reservoirs, and native farming in the Grand Atlas Mountains and in the interesting lands on the southern slopes in the great Sous Valley where waters disappear into the vast desert.

In all these various areas of investigations, I sought to give them the benefit of my experience in the United States and in other countries where I had studied land and water problems.

Chall: Did you have your own car with you this time in 1948?

WCL: Yes, for I learned the hard way that it was best to have one's own transportation always available, so we had shipped our family car.

Unique Trees

WCL: There are a few things typical of Morocco that I should like to mention. One was the large area of cork forests, although they are found elsewhere in French North Africa. Near Rabat, the capital city, we visited the Forest of Mamoura, encompassing 312,000 acres in old consolidated sand dunes. Most trees were new sprouts from old stumps that prior to the French rule had been cut down. The ground was heavily browsed by goats and cattle.

This forest is one hundred to five hundred feet above sea level, but we also found cork trees up to elevations of five thousand feet. The cork is harvested every ten to twelve years. Specialists cut the cork from the trees and workers packed it to cork depots along the highway, by donkey, horse or mule back. There, cork was piled in cords, six to ten feet high and several hundred feet long.

The best cork was used for corks for wine bottles and the poorer grades were exported for making linoleum base and other purposes, much of it to the United States.

Another tree, unique to Morocco alone and new to me, is the argania tree (Argania sideroxylon) which belongs to the family Sapotaceae. It is an unusual botanical peculiarity. It is a bushy tree with dense foliage when permitted to grow, and occurs only in the dryer, hotter portions of Morocco, generally to the south and west of the Grand Atlas Mountains, where the average rainfall is as low as eight inches.

WCL: It is a hard wood, evergreen, with spiny branches and narrow elongated leaves, excellent for fodder. It bears large crops of olive-like fruit which natives use for oil. This tree is a blessing to both natives and animals in this arid part of Morocco.

The goats climb the trees and go far out on limbs to browse in spite of needle-like spines. As we traveled through the argania "forest," if such it could be called, between Mogador and Agadir, we often saw startled goats jump down from high branches where they had been browsing.

The tree, when allowed to grow, is thirty to forty feet tall. Between the old trees that had been spared from charcoal burners in pre-French days, were young plants which were so heavily browsed they became large flat bushes. The argania forest was being rapidly destroyed except in areas under the protection of the French Forest Service.

This argania forest was unique. It served a three-fold purpose--browse for livestock, fruit for cooking oil, and wood for charcoal to meet the needs of the local population, for it was all the cooking fuel they had. The French officials were, therefore, extending their protection as rapidly as possible.

Chain of Wells

WCL: I also want to mention the rhetaras, or foggara, which are a "chain of wells," which some unknown genius in an unknown past first worked out--probably somewhere in the Near East.

The method spread elsewhere around the Mediterranean, but nowhere have I seen rhetaras more efficiently or extensively used than in southern Morocco, especially in the plain of Hous surrounding Marrakesh on the northern slopes of the Grand Atlas Mountains, and on the Sahara side of the Grand Atlas Mountains in the valley of the Sous River.

Rhetaras are an ingenius method of delivering ground water by gravity flow. I was amazed that the ancients, without precise levels, should have discovered how to do it. The method is first to dig wells on the upper part of the slope to reach ground water at a higher level.

Then a chain of wells is dug and connected by a tunnel between each at a grade of about one-half percent, sufficient to induce the flow of water, but less than the slope of the land surface. The tunnel is continued until the water comes to the

WCL: surface out on the plain.

Thus, ground water that was perhaps thirty to fifty feet below the surface at the top of the slope and would have been lost for use, now flowed freely at the surface, with no evaporation losses, and was available for people, livestock and irrigation. The plain around Marrakesh was one great network of new and old rhetaras. Competition for water was very intense and there was often cheating, when one village stole water underground from another village's rhetara. Strife resulted when the swindle was discovered.

In the Sous valley south of the Grand Atlas Mountains, the Public Works Department of the Protectorate had built the largest known rhetara, along modern lines with a re-enforced concrete channel one and one-quarter miles long. One-half was an underground tunnel 6.6 feet in diameter. It had a flow of thirty-five cubic feet per second and irrigated twelve hundred acres or more about the ancient walled city of Taroudant, where we saw what we called two and three story agriculture.

Under large olive trees, grapes or vegetables were grown. If it were a three story plan, we found that under the date palms were orange trees and beneath them grain or vegetables were planted. Power-driven pumping machinery could deliver water from more places and at far less cost, and in time would do away with this ancient but useful method.

Moroccan Independence

Chall: What do you think has become of all these improvements since independence?

WCL: Well, I am not very hopeful about the remarkable progress under the French being continued since Arab independence came to Morocco in 1956. No one knows how many billions the United States spent in setting up an enormous air base in Morocco. When severe drought came, we quietly fed the entire population for at least two years.

Yet we soon discovered that in case of trouble, our huge air field, built at great costs, would have become untenable because of sabotage by local people. I fear that many of the agricultural good works begun by the French will have "gone native" and reverted rather than progressed.

Report and Recommendations

Chall: Did you give a final verbal report to the government officials in Morocco, or a written one?

WCL: Both. Wherever I have traveled, I have generally, the day before leaving, had a full discussion with officials on their land use problems and given my recommendations. I was fortunate to be able to speak French and give them my report and recommendations in French.

I wrote a fifty-page report on Morocco which I gave to GETIM, the organization which had invited me as a consultant, and in it gave my recommendations for each area studied, and for their work as a whole in starting a soil conservation service.

They were much in need of a land inventory and the classification of lands for their best uses. I recommended the gathering of basic data systematically. I suggested the establishment of vegetation nurseries. I advised on the extended use of terracing, of various kinds for specific slopes and conditions, and the importance of contouring and proper outlet channels.

I indicated the need to study ground water aquifers for increased pumping of irrigation waters, and told of our successes elsewhere in re-charging ground water basins during winter rainy seasons.

I recommended the great need for Experimental Demonstration Projects, for where native farmers and grazers are backward, they must be shown, not told. As I found in China, agricultural improvement is not enough. There is need for a program of rural reconstruction that should include three major objectives:

(1) Improved land use to give greater sustained production per acre and per man.

(2) Decentralized industries, especially designed first to manufacture products needed locally to supply jobs for manpower released by more efficient farming.

(3) Improved water supply, sanitation and communication, including transportation at low costs, through good roads and common carriers. Pilot projects should be used extensively, and it would be well to establish one in each problem area.

It was a great satisfaction that I was able to carry on

WCL: all my work with government officials in the French language, and not be encumbered by a translator.

Algeria

Chall: Did you go to Algeria from Morocco?

WCL: Yes. We were welcomed as old friends on arrival in Algeria, for some of the young men I had met on my 1939 trip and who conducted me around were now high officials in the Agriculture and Forestry Departments. They wanted to show me how they had taken some of my suggestions and put them to practical use, and also to ask my advice on some of their present land and water problems. They had the usual strenuous and interesting itinerary worked out.

Algeria is more than four times the size of Morocco (851,000 square miles), but most of it is the lifeless Sahara Desert. If the map of the United States is placed over the Sahara, there would still be room left over around the fringes, so large is this area.

Our itinerary included, as in Morocco, the fertile, densely populated coastal areas, the hill lands, cultivated mountain slopes, and the Sahara side where there was some agriculture and much grazing where water was available.

The vegetation of Algeria in this once beautiful land of the Old Roman Empire was destroyed by the same Arab invasions that brought in a goat culture that gradually destroyed the people, the cities, the agriculture and even the traditions of agriculture of the Romans. The problems were the same as in Morocco and in Tunisia where we went next.

A missionary in Algeria, who had made historical studies of the region of North Africa, said that the Arab invasions also snuffed out about five thousand Christian churches. We saw the ruins of some in the excavated Roman cities.

Agricultural Practices and Attitudes

Chall: You mentioned the French had taken some of your suggestions of

Chall: ten years before and acted on them. What were they?

WCL: This is an interesting story and one that gives me very great satisfaction in its end result. In 1939, I was much concerned that there was no erosion control in the watersheds above the costly dams the French engineers were building.

The mountains were being extensively cultivated of necessity because of dense populations. Resulting erosion would rapidly have destroyed the storage capacity of the reservoirs. The engineers said they could do nothing about the problem because this was the domain of the Forestry Department.

I had asked to see the Chief Forester. He was an elderly, very pompous former official in France. When I asked what plans they had to reduce this menacing erosion above these costly dams, he replied, "We have a law to take care of this problem. It prohibits the cutting of any trees on mountain slopes and cultivating the land."

I reminded him that the people who lived there had to grow food to live. He insisted they had a law and that ended it. He was not interested in the fate of the native peoples. I had been told of an incident where a farmer had been arrested for clearing and cultivating some land to grow food, but while he was languishing in jail, his family, of necessity, had continued to grow food on freshly cut over and cleared slopes. At another time, a forester was assassinated when trying to enforce this ill-conceived law on mountain people.

The young man who ten years before had listened in on this discussion with the Chief Forester, but said nothing, was now the chief of the Division of Conservation of Soils in Algeria. His name was M. Saccardi. He was an energetic man of action.

On my recommendations ten years before, to put banquettes on the mountain slopes, he had secured and repaired eleven old bulldozers with which he had proved the success of this effort. At first, the Berbers, or mountain people, refused to allow him to put the banquettes on their good lands but allowed him to dig them on eroded lands that had been abandoned.

Banquette Terraces

Chall: Just what do you mean by banquettes?

WCL: It is a terrace adapted to slopes too steep for usual terraces. The banquette may be constructed on slopes as steep as sixty percent. The banquette is a slanting cut made into a steep hillside with earth thrown up on the down slope side. This

WCL: banquette channel is made about six feet wide. The outer bank is made about thirty inches high, but it settles somewhat lower. The slope of the channel is set at 0.5 percent and spillways for diversion of storm waters are located at intervals of about twelve hundred feet. Banquettes are located usually at vertical intervals of twelve feet.

The flat bottom of the banquette channel permits cultivation and growth of a crop by the increased infiltration of storm and rain waters that increase moisture supply available to fruit trees and vines. This measure, while costly to build in Algeria (in 1948, it was thirty to forty thousand francs per hectare, which is two and a half acres), made possible the reclamation of slopes for valuable tree crops, retarded storm runoff, stored more of the rain in mountain soils, and reduced the hazard of soil erosion.

Saccardi had planted figs, vines, olives, almonds and carob. The deeper soil and additional moisture due to the banquette made rapid growth. Within two to four years they were producing well. Then these lands that had previously been valued at seven thousand francs an hectare were valued at 110,000 francs an hectare.

The Berber people were pleased with this measure and asked Saccardi to put these banquettes in on their good lands. But he was handicapped by having only ten or eleven broken down bulldozers for the work.

Marshall Plan Aid

WCL: It was just at this time that I came to Algeria. Before leaving for Africa, I had visited my good friend, Dr. Isaiah Bowman, President of Johns Hopkins University, who was also in charge of Marshall Aid for colonies of our Allies. He had appointed Professor John E. Orchard, of Columbia University, as the Paris head to oversee aid to these colonies or protectorates.

Bowman suggested to me that if I found any worthy need, in my travels, to report it. I felt that no aid could be more important than bulldozers for Saccardi. I told him that for the big job ahead, he needed to have two hundred and fifty more bulldozers, and to make official application for them through the French government to Professor Orchard's office in Paris.

Some months later, I was called to Paris to chair a meeting of UNESCO on arid lands. I visited Orchard and asked about Saccardi's request for the bulldozers. He said none had been received. I knew something was wrong and found Saccardi had sent

WCL: in the request, but that it had been held up by the American agricultural attaché who reviewed requests for Marshall Aid and had said there was no need for these bulldozers for there was no erosion in Algeria.

I scoffed at such an idea and suggested that Orchard have Saccardi come up to Paris to testify on erosion and the need for these bulldozers to provide banquettes on which to grow food.

Saccardi, in his forceful manner, stated his case to the committee and to Orchard so effectively that Professor Orchard said to Saccardi, "You now have your two hundred and fifty bulldozers, but why didn't you ask for five hundred?"

But with his eleven old bulldozers plus his two hundred and fifty brand new ones, Saccardi was able to do a magnificent job. As one flies over French Africa, especially in Algeria, he sees the upland slopes are covered with these banquette terraces on the contour that provide food crops for the mountain peoples who previously faced malnutrition or starvation. Besides, now they were owners of producing lands that had increased in value tenfold or more.

So this is why I have much satisfaction in connection with my two trips to French North Africa, especially in Algeria.

Chall: Yes, I can understand how you must feel. Have you heard whether this good work is continuing since the French gave Algeria its independence?

WCL: No, I have not. But at least those who have had their lands on steep slopes put into banquettes will continue to be blessed with more food than they had on their formerly eroding lands.

Agriculture in the Sahara

Chall: You mentioned studying land use also out on the fringes of the Sahara in southern portions of populated Algeria. What kind of cultivation did the people there practice?

WCL: It was here we found emerald oases, winding like green threads along the water courses that came down from the mountains at the north. It was refreshing to come from the barren glare of the desert into the cool canopy of their waving fronds. Sometimes these oases were irrigated by springs or streams coming to the surface. Others were irrigated by underground water so near the surface that palms could stretch down their thirsty roots and drink.

WCL: It is a strange paradox that the plant which requires the most water--seventeen feet a year--grows only in the desert. The delicious dates of southern Algeria, particularly around Biskra, are the immediate parents of our southern California variety.

When we were there, the fresh crop had recently been gathered. Once we had forty-eight hours when we could get practically no other food. The first fifty or so dates were delicious, but after that, our enthusiasm cooled somewhat. Nevertheless, we ate some forty to fifty pounds in ten days.

We found the most disagreeable deserts of all lie around oases or water holes, for they have been so overgrazed that not a blade of vegetation is permitted to grow and the desert is unbearably dusty and ugly.

Desert oases are rated, not by population, but by the number of date palms and are thus noted on the map. Biskra had 200,000 palms; others, much less. Palms are owned by the village or by individuals. When fruit is ripening, the owner takes his blanket and tea pot and camps under the palm tree, day and night, until the harvest of approximately one hundred pounds of dates per tree is harvested.

Under this umbrella of shade, the family raises a few vegetables to vary the diet. Dates are pitted, dehydrated and pressed into a hard ball resembling chewing tobacco. This is so sustaining that a small hunk is sufficient rations for an entire day of desert travel.

Finding Water on the Desert

Chall: Were these oases as overpopulated with people and goats as the surrounding country?

WCL: Yes, and as seems to occur among backward peoples, there was a population explosion that was of considerable concern. There was developing, however, a possible solution to the population problem, which I discussed with M. Martin, who was chief of Operations for Development of Algeria, and who was carrying out the initial investigations.

M. Martin explained that the mountains on the Sahara side have a rainfall of thirty inches or more. The geologic structure was a porous formation that dipped down rapidly. Both below and on top of this extensive porous formation there were impervious layers that enclosed the water-bearing stratum.

Far out on the desert, as at Touggourt, there seemed to be much more water than could ordinarily be expected. M. Martin, a

WCL: famous geologist also, reasoned that if this water-bearing stratum deep underneath the desert could be tapped, there might be developed water for new additional oases.

He bored some exploratory wells and at a maximum of two thousand feet, tapped the water-bearing stratum he had hoped to discover. This water was under pressure and came near the surface as artesian wells. This underground water aquifer, as I remember it, was some one hundred feet thick and covered an enormous area. Of course, M. Martin realized there would be a limit on the amount of water capable of being withdrawn, and the water proved to be somewhat salty, but well within the tolerance of dates.

It was estimated that this discovery might make possible a sufficient number of new oases to support several hundred thousand desert peoples. Since Algeria got its independence, I have not heard whether this fine new project is being carried out or not, for it would require French vision, French technical ability and French capital.

Converting Dry Lakes to Reservoirs

Chall: That's an interesting story of discovery of water. The French apparently had very fine technical men working in their areas of North Africa.

WCL: Yes, and another example was told me by the famous geographer, Mr. Gautier. It was he, you remember, who told me there had been no change of climate in North Africa since Roman times, that only the people had changed.

It was Gautier's son, a hydrologist, who worked out a unique plan to develop an enormous increase of water for the coastal plain for irrigation, municipal uses and a sizable amount of electric power. As I looked over the topographical features of this project, I could see that it was feasible.

Inland from the coastal plain there are two mountain ranges, separated by an elevated plateau. The mountains are some five to seven thousand in elevation and intercept considerable amounts of rain that drain off and spread out into wet weather lakes or Chotts. Thus the water table rises above the basin and later evaporates finally to a level under the surface of the Chott where it is untouched by further evaporation.

Gautier's son worked out an ingenius method of converting these so-called dry lakes or Chotts into reservoirs and conducting the waters through a tunnel to bring them to the coastal plain where they were needed. He located a tunnel sloping from the center of the Chott, at an elevation which would keep the water table

WCL: below the evaporation zone.

The water was drained away in the tunnel through the mountain and dropped in the coastal plain for storage and use through hydro-electric plants. Thus the annual waters, in enormous amounts that formerly evaporated, were saved, electric power was added and a useless Chott or dry lake was made use of as a collecting reservoir. I understand that this project was put in after I left Algeria.

The Berbers

Chall: Did you also make a study of the Berber peoples?

WCL: Yes. At different times, we spent several days with these interesting, independent mountain people who date back to the Stone Age here in French North Africa. There have been many conquerors, but the Berber people have never been subjugated.

With the Moslem invasion, they had to become Moslem in religion to save their lives, but they are not Arabs. They were then called Moors and contributed much to the culture and fighting force of the Arabs. They make excellent mechanics, artisans and skilled workmen.

Of course, many of these Berber mountain people benefited by the banquettes I just described, that did much to lift them out of poverty. But there are other mountain areas where erosion had been so severe that soils were too thin and rocky for making banquettes on them.

We stayed at a mission station in a mountain Berber village and from our porch we could count sixty-five Berber villages. All were in dire poverty. They had no doctors and few schools. Their few olive trees had exposed roots showing how erosion has eaten away the soils. People were so poor that many times a family owned only half of an olive tree. Each family picked its half of the tree at the same time to avoid cheating. Sometimes children inherited specific branches.

Their goats seemed to be eating rocks. A few scanty stalks of grain were grown wherever possible. The mountain population here was so great and the people so crushed with ignorance and poverty that little constructive work could be done. Erosion had to be quickly checked. How, I wondered, could this be done under the circumstances? For the people would be forced to migrate, even though there was no place for them to go.

WCL: All this required land reform and redistribution, but under an independent Algeria, we know this is not being done.

Report and Recommendations

Chall: Did you give the French a written report as you did in Morocco?

WCL: Yes, I am sure I did, but I seem unable to locate it. But the basic recommendations were the same, except that in Algeria I laid special emphasis on construction of banquettes in mountain areas which were not too eroded and rocky.

In Algeria also, there was need for an inventory of lands which designated their best uses, whether for forests, grazing, dry farming, tree crops or irrigation. There was much need for nurseries to grow the required seeds and plants. There was much need for demonstration areas and for pilot projects to be established in each problem area, for here as elsewhere the native farmer does better when shown, not told.

Even so, he was very slow in taking on modern ways of farming. Even though they saw the more progressive farms of the colonials, they continued their old traditional farming methods. After looking over many of the farms of the Colons, I designated some as being excellent and suggested that they be made into demonstration projects for the area.

French-Algerian Relations

WCL: I felt that a hundred years of French influence had done much for the country and the people of Algeria. All were French citizens and could go to France for work or training without passport limitations. Cooperation between France and Algeria could have been very advantageous to both countries. But Algeria demanded independence and got it.

Tens of thousands of the French and European Colonials--both in business and in the large farms--had to leave, and the economy doubtless does not permit carrying on the fine development work that was in progress.

From what I have been able to hear of progress in Algeria, there has been general retrogression of the many good works that were in construction or in the planning stages under the French rule.

The present Algerian government has mortgaged itself to

WCL: Russia for military arms and equipment. We now hear that the billion dollar naval base soon to be evacuated by the French is to be used by the Russians as a Mediterranean base, along with one in Egypt and Syria.

Tunisia

Chall: Tunisia was also a part of your eight months of consulting work in soil and water conservation in North Africa, was it not?

WCL: Yes, though I spent less time in Tunisia. It is much smaller than Morocco or Algeria, being only about 49,000 square miles; and since almost half is uninhabited Sahara Desert, there were only about 27,000 square miles of inhabited lands on which to study various problems.

Tunisia has from the beginning of history been important as the center of the North African Mediterranean world, both strategically and in the richness of its resources and agricultural production. Here Carthage and the Phoenicians ruled supreme until conquered by Rome.

Tunisia has inexhaustible phosphate mines and exports about a third of the world's production. She also exports iron ores and zinc and lead.

Although I was taken to see these mines, my principal interest was in the agricultural lands that grew the cereals, about three million acres of olive plantations for oil export, wine-grape vineyards, grazing lands that feed millions of sheep and goats, and Tunisia's remaining forests.

M. Tixeront and M. Cathelinaud both conducted me on field trips throughout Tunisia and I gave to them my opinions and recommendations in a written report, so I shall not reiterate here these technical matters. Generally speaking, all that I had recommended for Morocco and Tunisia more or less were applicable to Tunisia.

Chall: You told about the olive plantations in Tunisia around Sfax and other communities which you saw in 1939. Were they still flourishing in 1948?

WCL: Yes, the French had vastly increased the area of their olive plantations. But as I said before, the French were not using

WCL: the old Roman basin method, but planted widely separated trees and kept the soil between bare of vegetation to prevent competition for moisture.

I pointed out to French officials how erosion was starting in little gullies or sand hummocks blown by the wind. The French had ignored the basic contour layout, but planted in straight lines up and down the gentle slopes of the rolling countryside. This, over a period of time, would again seriously damage this fair land by water and wind erosion.

Problems of Overgrazing

Chall: Were sheep and goats overgrazing the ranges as elsewhere in North Africa?

WCL: Yes, wherever herds were grazed. The nomads practiced transhumance--that is, yearly travel to the desert for winter grazing and then back up into coastal areas for summer feed. They grazed the stubble after harvesting cereals and overgrazed forest and mountain lands.

In my discussion of Morocco, I told of the extensive use of rhetaras to deliver water from mountains out into arid lands. But here in Tunisia, the French had been increasing water for herds and thus extending the range lands, by an extensive program of cleaning out and repairing old Roman cisterns and building new and larger ones.

I was shown a new French-built one that contained 750,000 gallons of water, sufficient for a new village and its herds. Officials, however, did not regulate grazing on wild pasture lands, and I saw trouble and disaster ahead for natives and their herds.

We visited the forest lands where trees remained. There were still some Atlanticus cedars, but these forests were overgrazed as were the lands of their cork forests. This overgrazing of all possible lands, due to over-population of both people and herds, was a very difficult problem and Tunisia had not as yet tackled it.

Report and Recommendations

WCL: I gave my final verbal report in French to the government officials

WCL: of Tunisia, handed in my written report and recommendations. This terminated a very enjoyable and, I hope, fruitful attempt to help the French areas of Morocco, Algeria and Tunisia, to better understand their soil and water problems and to do something about them while there was yet time.

Jews in North Africa

Chall: You were able to travel freely in all parts of French North Africa, so I presume at that time the countries were politically stable.

WCL: Yes, as far as we were concerned, but I should say that in 1948, the Jews of North Africa were having a bad time. Just the week before we drove from Morocco to Algeria, we passed through the city of Oujda, where in one day, ninety Jews had been killed and a hundred and fifty shops looted.

The French officials told us that for some reason, the French military was not around on that day when a rumor was started against the Jews which rapidly developed into a looting, killing mob. They said that the Arabs allowed the Jews to prosper for a time, and then invariably, sooner or later, robbed or looted their shops. The Jews were not at all secure.

At this time, the British Mandate government of Palestine was preparing to give up the Mandate at the request of the United Nations. The English were arming the Arabs and taking arms from the Jews. All Arabs were being prepared for a Holy War to exterminate the Jews when the British military left Palestine.

Whenever any Jewish youth wanted to leave any North African country, the Arab governments refused, and if a Jewish youth was caught trying to get out of the country, he was killed at once. The Arab governments wanted to prevent any Jews from going to Palestine to fight for their new country.

Lowdermilks Adopt a Moroccan Jewish Family

WCL: We wanted to get a Jewish personal friend of ours out of Morocco, and used the excuse we wanted him to travel with us through Spain as an interpreter, enroute to Marseilles, and to help us with any car trouble, and applied for a passport for him. We were told this was possible; but when they asked his name and found it was Mark Cohen, they began to renege and say they had many Arab young men who would be very glad to go with us. But we insisted we wanted someone we knew.

WCL: We had to go over the head of the anti-semitic immigration officer to a high French official to make the arrangements. But even so, we had to slip the Arab official a five dollar bribe in a handshake at the immigration office before we finally got the passport.

But in time we managed to get the entire Cohen family to the new state of Israel. All seven of the children have been exceptionally bright and dependable. The younger four have worked their ways through high school and are in college. All seven are outstanding.

We call them our adopted Jewish family and we helped them financially in Israel to buy the first home they had ever owned.

CONSULTANT TO GOVERNMENTS IN FRENCH NORTH AFRICA

[Taped questions and answers]

Analysis of the French as Colonial Governors

Chall: Today I want to continue the subject of French North Africa with a few more questions. What you gave us in the written questions and answers is very interesting and well detailed, but I have a few questions on the French colonies.

Now as I recall, you thought that the French government was doing a very good job in its colonies, and you were sorry to see the French leave as a result of the independence movement. You felt that the Algerian natives were well treated by the French government and perhaps there was no reason for independence as such.

I wonder whether what you saw in terms of what the French were doing was a good work on the land, and whether the people had some justifiable reasons for their dislike of the colonial government that may not have shown up on the surface as you were seeing it?

WCL: Of course, that is something about which one has to be discerning and careful in drawing conclusions. But I might cite a few instances that I think illuminating in this respect. In one case, the French officers of their forest service were taking me out into regions where they had been carrying on work to conserve the soil.

At lunch time, the ranger invited the three or four higher officers, myself and my wife to lunch. The interesting point here was that this man's wife could not appear because she was a Mohammedan. She must not appear before menfolks not of her family. So our host had to serve and bring the food from the kitchen where his wife was preparing it.

This French government official was a Mohammedan. This incident gave us the realization that the French were marrying local people. The French encouraged integration with local populations, so the chances of fair and constructive treatment would be much greater than if they had an entirely separated and hostile attitude.

Chall: I see. So a more general integration between the French and

Chall: native North Africans would have come in time, you feel?

WCL: Yes, exactly. And in a way, that would be a more lasting integration. They would have wanted to work out problems for the benefit of both if they were integrated.

And we found this true in the irrigation projects. The Caids, or governors of the districts, were appointed by the French. They were responsible for promoting irrigation projects and making irrigation water available to the local farmers. It was a practice--I remember in Morocco, specifically, in the same GETIM administration--of the French government to make available a half or less of new lands developed to the French colonial, and the other portion made available to the local and Mohammedan population.

These dams the brilliant French engineers were building were really beautiful engineering jobs. I had great admiration for them and I reported on them to our own government.

Now there is one point I want to emphasize again. That is, the statement made by President Franklin Roosevelt in 1943, three days after he arrived in Casablanca, that the French weren't giving equal treatment to the Mohammedan population and had given the French colonials the best land.

I had studied these lands in 1939 and seen the work of the French ten years later in 1948, and found they were doing an excellent job with their native populations, as described in the written questions and answers.

Lowdermilk Challenges American State Department Official

WCL: Now there is one other point. My understanding of this statement by Roosevelt was illuminated quite strikingly when I was leaving Tangiers. As was my custom, I always called on our American representative when I arrived in a country, and when I left, to announce my departure.

Generally, our State Department people asked me what I had found and my impressions, and I felt they were entitled to the best of my observations. When I was talking to the American minister to Tangiers in my goodbye visit, he now, five years later, made the same statement which Roosevelt had made. Apparently, this was still the opinion of our State Department.

WCL: Having studied the area so thoroughly, I challenged their statements. I said, "Now, Mr. Minister, I'm afraid that I cannot agree with the statement the French colonials have occupied the best land and taken it from the Arabs. In many places, these lands had never been cultivated before because the Arabs could not remove the camelops or clumps of palmetto palms and had no means of eliminating these thickets. The Arabs only grazed these lands between these thickets."

Now I explained how the French had come in with powerful tractors and plows and torn out these tough thickets, and made of these meager grazing lands splendid agricultural lands.

The State Department people had seen the French cultivating these level lands, while the Arabs were on the upper lands which they could work because the palmetto hadn't occupied the ground. So the Americans assumed the foreigners had taken the best land and pushed the native people onto the worst land.

I said to the American minister, "Roosevelt's and yours is not a true statement of the situation. The French have not restricted all these lands they reclaim just for the French, but rather they give the local population a part of the areas reclaimed. They weren't throwing the natives out, or forcing them up into the hills. They had always used these hill lands."

The French were actually giving them additional land. They let the additions be divided between the French Colons, or settlers, and the native people.

The minister hadn't heard this side of it. I didn't think it was quite the proper place to say it, but our diplomacy should be established on facts. [laughter] It is easy to come to hasty conclusions that without sufficient knowledge of actual situations may be wrong. I was glad for this occasion to make this clear to our American consul, but how much he accepted what I said, I don't know--there never was a follow-up.

Handling the Population Increase

Chall: While you were there, did you feel a kind of impetus toward independence, or was this yet underneath the surface throughout the French colonies? Did the French think they were in danger of losing their colonies?

WCL: Well, the French were going ahead with their fine work, regardless. I'm sure they felt Algeria was an integral part of France and always would be.

The French had reduced the death rate in all areas. The population had doubled in a very short time. Much of it was due to the fact that they established peace and order. The nomads, Bedouins, who wandered through the desert, who had formerly pillaged and looted, became migrant workers; and sanitation and medicines made the adults live longer and prevented the former high percentage of deaths in childhood.

These French Protectorates not only had the natural increase of population, but also had large migrations into the new areas they developed. So the rate of population was doubling in twenty years or less.

Chall: How did the French feel about this?

WCL: They went ahead, carrying out their engineering studies, and putting in all projects that could be done that would increase food supplies

They also were developing the phosphate mines, which are the richest and most abundant of anywhere perhaps in the world. The French were using these phosphates in fertilizers and selling it locally to increase the production of food stuffs which was so basic to meeting the situation. Large quantities were also exported.

Chall: This was their primary way of meeting the population explosion? Those were uneasy times. Did the French feel they were working against time?

WCL: I said to the French officials, "Here you have introduced sanitation, medical care, general hygiene, and provided better nutrition that has reduced the death rate, so the natural increase has doubled in twenty years, besides migrations into the populated areas."

We asked, "How do you reconcile yourselves to accepting this increasing population, in working on these projects for increasing the production of food stuffs, when you are not producing enough increase in food stuffs to match the increasing population? Obviously, you are not winning the battle here."

They said, "What else can we do?" They were carrying on constructive and sound measures. The only difficulty was that it wasn't moving fast enough to meet the growing demands of the increasing population. So they were in a position where they had to carry on the battle, although they didn't have the prospects

WCL: of winning.

Chall: Rather hopeless situation to be in. Nobody talked about birth control in those days, did they?

WCL: No.

Thoughts on Independence

Chall: Did you ever talk to any of the Mohammedan people about their feelings toward the French, or about their feeling about independence?

WCL: At that time, there was little talk of independence. The local population was busy in all the many developments for progress in the country. Later Arab nationalists from Egypt, Syria and elsewhere began to come in and stir up Arabs in these French areas, to clamor for independence. This was a great loss to native populations, to lose the many and growing advantages given them by the French.

Although I talked with many local Arabs who spoke French, I do not remember that any complained at what the French were doing.

There were certain attitudes, but I had a feeling that the French colonies were fairly stable. There was intermarriage; there were a lot of cases of this. They told me that it was not uncommon for the forest officers to marry into the native people.

They were good stock--those native people are Berbers, you know. These people are more skillful with their hands than the Arabs. They were especially good mechanics. And the French industrial empire depended a great deal upon the skills of these Berbers. I often wondered, but I haven't had any opportunity to find out, what effect it's had on the skilled labor of North Africa now.

XI CONSULTANT TO BRITISH AFRICAN COLONIES, 1949-1950

[Written questions and answers]

Chall: Now that your work in North Africa was completed, what were your plans for the future?

WCL: We did not return at once to the United States, but went directly to Oslo, Norway, to attend the 1948 International Union for Geodesy and Geophysics. I had been president for the years 1941-1944, of the American Committee, the American Geophysical Union. We then flew for the first time across the Atlantic, a trip that has been repeated many times since then, and returned to our Berkeley home, but alas, not for long.

Scope of the Project

Chall: Had you already accepted your next appointment and where was it to be?

WCL: Yes. I had already been approached to accept an appointment for a year to make studies in British colonial areas of Africa, south of the Sahara, to be financed by Carnegie Corporation, and co-sponsored by the British Colonial Office and the British and American Missionary Societies. The project was initiated by John H. Reisner, secretary of Agricultural Missions, Inc., of New York, which is an international and inter-denominational body.

This project made available to the governments concerned my services for study and appraisal of local problems in land and water use with conservation, erosion control and fertility problems of the native African farmer.

I was to attempt to awaken British government officials, missionaries and Africans in all walks of life, including students, to the relation of land use and soil erosion to civilizations, and specifically the relation of traditional practices of land uses to local culture and its welfare, present and future. The far-reaching implications of deteriorating lands and declining productivity of Africa, along with population explosion--doubling in twenty-five to thirty years--was little

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THE LOWDERMILK - AFRICA PROJECT

I. AUSPICES

Agricultural Missions, Inc. in cooperation with:

A. Secretary of State for the Colonies, London
B. British and American Missionary Societies

II. THE PROBLEM

The continued destruction of land in Africa through inept use constitutes the greatest threat to the future welfare of all Africans. The problem of erosion is already acute. In some cases over wide areas of west, east, central and south Africa, the situations have become almost unmanageable. Government in recent years has become increasingly aware of a rapidly deteriorating situation. It is questionable to what degree this same situation is understood by the Africans. The implications of it are little understood by the great church and missionary agencies.

To deal with the problem of soil erosion intelligently and effectively, it must first be understood. The greatest asset in dealing with the problem will be the understanding and cooperation of the African villagers. The African is to an unusual degree emotionally attached to his land. An appeal to the African along economic lines has definite limitations, as experience has already shown. An appeal to the African's emotions is difficult because it involves religious factors seldom understood by religious leaders (the whole missionary enterprise, with minor exceptions), and for some reason it is an approach difficult for Government to use. Some way must be found to arouse the African to accept a far greater degree of responsibility for the wise use and therefore the preservation of his land. The African cannot continue to misuse his remaining land resources and expect the Government to protect him, although when shortages occur he will hold Government responsible for taking care of him.

Already in some parts of south and east Africa the cost of providing adequate soil and water conservation measures is so great that Government cannot cope with it, except on a token basis. The Africans in the long run will have to pay the bill or adjust themselves to the consequences. The chances of dealing with the problem successfully will be much greater with an aroused African conscience. The problem, therefore, is to arouse this conscience and to capitalize on his emotional attachment for the land (a) by developing his understanding of the long-time issues involved, and (b) by securing intelligent cooperation in the conservation programs which only Government can institute.

WCL: understood by leaders in general, and by the Africans in particular. We left in February, 1949, and returned to New York in mid-January, 1950.

Plans for the Tour

Chall: In what British colonial areas did you make your studies?

WCL: The proposal was that we should go to British West Africa first, to Sierra Leone, Gold Coast (Ghana), Togoland (Togo), and Nigeria; then fly over the equator to Swaziland, Basutoland (Lesotho), Southern Rhodesia, Northern Rhodesia (Zambia), Nyasaland (Malawi), with a fifteen-hundred-mile swing around the Union of South Africa by auto. In the Union, I gave fifteen lectures to large groups. I also made a study in Tanganyika (Tanzania) of the ill-fated British "Ground-nut" scheme.

In the first nine colonies, we literally went to the end of every main road and also into remote corners of the countries, for I wanted to see for myself what was happening to the African farmer and his fields. In this way, we got a general view of much of the African scene, and of the nature of problems facing the African in growing food for himself and family, and for rapidly increasing urban populations on deteriorating lands.

I wanted also to see the problems resulting from shifting cultivation with its soil erosion, loss of fertility by leaching soils and by lack of fertilizers. I was concerned with problems of British agricultural officers and the obstructionism of the native African, as well as with particular problems of native women farmers and the many complex problems of witchcraft and witchery in connection with all phases of farm practices.

So in these studies, we became acquainted with the immense continent of Africa south of the Sahara, its great potentialities and its exceedingly difficult problems.

Africa: From the Air and on the Ground

Chall: Who arranged for and conducted you around on these studies?

WCL: We had wonderful cooperation from government officials everywhere,

WCL: who made all arrangements and were either with me or had made arrangements for well-informed missionaries to conduct me to all areas of special interest.

We had a double view of these colonies, for we flew over them, "reading the land," from one to several thousand feet up, traveling under the great summer cloud bank. This is advantageous for one can see farming practices, the size of farms, the extent of gullies, the white spots giving evidence of removal of topsoil by sheet erosion. It gives an over-all "bird's-eye view" not available otherwise.

Studies on the ground were also extensive. We traveled some twenty thousand miles by automobile. We examined type conditions of land under use and misuse, into remote corners of British Colonial Africa.

We made dozens of talks to African Chiefs and their Elders, who called in their farmers to hear me through an interpreter. Whenever electricity was available, I illustrated my talks. Arrangements were made for me to speak to mission and government school students, from lower divisions where talks were interpreted, to high school and colleges where my message could be given directly in English.

I also spoke at numerous church services and public meetings of all kinds, everywhere talking on man's responsibility to the good earth that must feed present and future generations, and trying to arouse a greater interest in and sense of urgency in working out ways to increase production for ever-enlarging populations in the face of excessive wastage of farm lands and decreasing productivity.

In almost every area, government officials accompanied us and we had continual consultations on local soil and water problems, both on native and on European lands. So my picture is of Africa in the middle of the twentieth century, just before the rapid disintegration and fall of the British Colonial Empire.

Summary of Findings

Chall: Your findings then should have unusual significance for future research students, who wish to study Africa in this time of transition.

Inez ate with women dressed like nuns and there was a beautiful woman- Mrs. Edmonds- who had a large place and were making it a retreat for christians. He a retired Eng. officer from India I think

Gave speech in P.M. Father said that in teaching 10 commandments that he would require students to learn the 11 th comm. Bro. Roger Castle- very interesting chap. Took pictures of children working in the garden.

OLD UMTALI-- arrived at 5 P.M. and heard I was to give a talk to student body at 7. Gave it out in the open. Next A.M. at 7 talked to students at chapel- began by quoting "Thy kingdom come " Thy will be done on earth as it is in Heaven. and showed what was necessary to realize thefulfillment of this prayer.

Went out over farm-- had been contour ridged--nebd of land classification-- note the incompleteness of conservation work here. I took time off to see the farm for I had been so rushed and we kept officials waiting and they were concerned for us. We visited forest plantations of rapid forest growth, Mx 2 cu. ft per acre per hour

We lunched in Umtali and spoke 2 ½ hours then to home of Resident Comm. for native affairs to sun-downer-- They were very cordial- but to what end.

We were delayed returning to Old Umt. and the Hewey's gave us a light supper. Got a list of M.E. Missions lands from Mr. Humphreys. See page 780 for names and no of acres.

Arrived Umtali at 8;30 and dropped down into hot Odzi valley with Baobab trees. Looked at irrigation of Yanyadzi and the power plant with a 70 ft ? - power used to grind mealies. and to saw lumber for the carts which they are making. Some 130 made and 63 sold for L. 25 Very sturdy using wheels and axel from

G.B. is fostering aristocracy-- rather than democracy-- a sort of aristocracy that must give way soomer or later, It is a time serving policy that should be brought to an end.

KAMPALA THESES.--- one of them

No human program-- in political policy, educational plan or religious practice, dogmma can long endure unless it provide for f ll use with wise- intelligent use and conse vation of the land base of soils, waters, forests and crops- grass, forests and animal life of the good earth.

No longer can people expect by mere advantage of position tocommand higher standards of living-- f oor from now on it will be a matter of service to himanity- to people, efficiency in that service will be the measure of command of the good things o f life.

There needs to be a change in the British and Fr.colonie

It is unrealistic in an attempt to give to these backward people the last fruits of an old civilization-- outmoded n many respects already The educational set up is all wrong in its objectives.-- if not in stated objuctiv s- at least in ways in which it is carried out.--- I have seen a lot- heard much and pondered well and searched to find a solution to a situation that is fluid, critical and dangerous to B. Col Policy

While muc freedom is given to these people in talk, littl or none is given in dealing with resources of the country, f or everything of any value in the ground, other than soil is vested in the crown, and to an extent the land is too, for a miner can go anywhere, prospect anywhere and occupy and work farm lands or vi,lages, without regard to t raditional right of people in this area.

WCL: I hope to be able to secure through Carnegie Corporation or Agricultural Missions, Inc., of New York, my long, 150-page typed report on this year in Africa, to file with this report.

I find it difficult to summarize my findings on British colonies in Africa, such as: impacts of government on the African, the successes and failures of missions on the African, the unfortunate emphasis in education in Africa, the difficulties of British policy of indirect rule through reactionary chiefs, the problems of native obstructionism to British agricultural officers, the influence of Juju, or witchcraft, in all phases of farming operations. All this involves so much more than can be told here.

I made a special study everywhere as to the reasons the African farmer does not more readily take on modern methods of farming. All these subjects I shall want to discuss, for all are influenced by the heavy hand of the past that hangs over all attempts at progress for the native African.

In some of these areas, the over-all picture is the same so I shall deal with these together for all ten colonies. There is quite a distinction between British West Africa and the colonies south of the equator, so for specific conclusions, I shall divide the studies to the north and to the south of the equator in Africa. While I am using the past tense, because I came to my conclusions in 1949-1950, I am told that many of the conditions that I am discussing still hold true in much of Africa today.

British West Africa

WCL: We flew over the great Sahara Desert from Algiers to Kano. This desert is larger than the United States. We spent the summer months below the great bulge in British West Africa which includes Sierra Leone, Gold Coast (now called Ghana), Togoland and Nigeria. I call this the "Hot House of the world, with a sand culture."

Colonial Practices

WCL: Formerly, this was called the "white man's grave," because of frequent deaths from yellow fever, vicious malaria, tsetse fly,

WCL: bilhartzia, and other diseases and poisonous bites. The British had decided that this region should remain the "black man's land." There would be no colonization or settlement by the white man.

The British would rule and claim all wealth, aside from farm lands, for the British Crown. The ivory, all diamonds, fine mahogany woods and all minerals belonged to the Crown and were exploited accordingly.

The African received a wage of a shilling and a half for his day's labor. He was permitted to use and misuse the land in growing his food by early iron age methods that changed little during the many years of British control.

The British government, however, had brought an end to slave raiding among the tribes, discouraged cannibalism and tribal wars, brought about law and order, introduced medicines of many kinds, and developed education and schools by subsidizing the missionaries. The British laid out and built dirt roads. Colonial administration took a certain paternal interest in the African and imported food to famine-stricken areas, and the like.

The result of all this was that colonial populations doubled in twenty-five years, and the early iron age methods of shifting cultivation were entirely inadequate to increase food production to keep pace with the increasing population.

As far as the land was concerned, however, there was never any competition between the black man and the white man, such as developed in colonies south of the equator. There seemed little or no race prejudice. This was recognized as the black man's country with the white man as overseer.

Each governor and the high commissioners in the four British colonies of West Africa entertained us at state dinners and always there were leading native educated Africans included among the guests. By this time, there were many who had been educated in Cambridge or in Oxford, England, and were appointed as judges, lawyers, doctors, educators and the like.

Chall: Were conditions in West Africa very backward?

WCL: I know that comparisons are odious, but in Sierra Leone, where the British had been for fifty years, they had not done a fraction as much for the country or native peoples as had the French in Morocco in only thirty-five years. The latter had built ten thousand miles of paved, tree-lined roads crisscrossing the country and twenty thousand miles of tracks usable in dry weather, had piped water and put in electricity in most native towns, developed considerable irrigation, and were giving expert technical assistance to the farmers.

Water Resources not Developed

WCL: In Sierra Leone, I found only one plow, and the only tractor was at the airport. No city had electricity until the week we arrived. The capital city of Freetown had no water. Natives were bringing small pitchers to the missionary home where we stayed, and begging for a little water from the cistern; yet only a few miles away was an abundance of water.

One hundred and fifty inches of rainfall fell annually in the mountains; the Sewa River tumbled over eighty-foot rapids and falls but was not used for hydro-power. I found not one foot of irrigation anywhere, though there were many streams and everyone talked about the usual "two hunger months" before the rains came.

When we asked why the abundance of waters nearby were not piped into the cities or their power used for making electricity, people said, "This is such a poor colony." But we saw two mountains of almost pure iron ore, easily accessible to ship downgrade to the coast, and gem diamonds of excellent quality were numerous, but of course they were claimed by the Crown.

It was practically a capital offense for a native to have a diamond--he must turn it in to the government immediately he finds it. While we were there, a native Christian found a large raw diamond in his field when he was digging with his little hoe. He brought it to the missionary who insisted he take it to the government at once. For this diamond he received the sum of $1.75, though we were told the large diamond when cut would be worth $175,000.

I discussed with the governor of Sierra Leone, Sir Breckenridge Stuke, the need for England to make the colonies prosperous and have a broader tax and income base, rather than to keep the colony poor and useful only to provide England with raw materials and employment in processing plants.

He agreed with me, but said he could do nothing about increasing the wage of one and a half shillings per day, though food and other things had doubled in price since this wage was established.

Agriculture not Developed

WCL: The British doctor who examined young men for the army told us that eighty-seven out of each hundred examined had to be rejected largely because of nutritional deficiencies. Projects for increasing food supplies for Sierra Leone were still only blue prints. Agriculture was the same as it had been one hundred or one thousand years ago. This method would never be able to

WCL: provide food enough for growing populations. An agriculture for the future was the only hope for the colony. The rich mineral resources should have been used to benefit the native peoples of the colony as well as distant stockholders in England. Sierra Leone was a Protectorate, but what was it to protect and for whom?

We were in northern Sierra Leone and Gold Coast (Ghana) before the rains came, and there was famine. These were called "hunger months." Women in some places had to walk ten miles for jugs of water. No pumps or wind mills provided people or herds with water. Yet all around these areas were beautiful possibilities in the natural land features for conservation farming, with soil and water control to increase production many-fold.

These northern territories were all so poor, many of the people could not afford to wear clothes, except animal skins. The women often wore a bunch of leaves fore and aft, tied to a string around the waist.

It was a joy to travel about in the rain forests in the cocoa-growing regions in Ghana and Nigeria, where native Africans had purchasing power to buy colorful clothes and ride bicycles and build fine churches which were not only self-supporting, but were sending out missionaries to their own peoples. Many Africans, particularly among the Ashanti in Ghana, had become rich and retired into beautiful homes in the cities.

Shifting Cultivation and its Consequences

Chall: What do you mean by the African native using early iron age methods in farming?

WCL: The general farm practices were little different from those used in stone age times, except that a piece of iron replaced the stone on the short-handled hoe and the dubbed ax. The native now had a machette but as formerly, he used fire as a farming implement.

Traditional farming was shifting cultivation, or bush fallow. At the end of the wet season, the native African cuts down a patch in the bush with his short-handled little ax and leaves the slash to dry out during the dry season. Then just before the rainy season, he uses fire to reduce it to ashes to act as a dressing of fertilizer on the soil.

Stumps of large trees often are not killed and sprout again;

WCL: burned limbs are scattered about. It is a very untidy field where the farmer digs individual holes into which he or his wife plants seeds of guinea corn and maize, peppers, upland rice, tubers, yams and cassava in mixture.

When the rains come, the plants grow and a good crop is assured the first year. But the heavy rains rapidly leach out the soluble ash dressing with its minerals drawn up by plant roots of former bush. The second year's crop is poor and scarcely ever is it possible to grow crops on this clearing for a third season. So it is abandoned and allowed to return to bush, and the trees again sprout and grow.

During times past, populations were small enough so that for any tribe, this cycle would take twenty to twenty-five years. This gave time for the development of deep roots that would again draw up the minerals that had leached down from the ash in the last burning and when again burned, would supply a fertilizer dressing for another good crop or two. There was little gully erosion, for fields were small and had a cover of vegetation growing during the time they were being cultivated.

When populations increased, there were greater numbers of farmers demanding of their chiefs allotments of lands on which to grow food. Steadily the fallow season decreased--farmers could not wait for much bush to grow before chopping it and burning it for another scanty crop.

Already in some places, we found that fields had to be cultivated and planted each year. There was not enough land to go around. We found in some areas as around Enugu, Nigeria, that some farmers were walking nine miles each way to have a little patch of land to grow food.

This meant that most men had to go into the mines where they worked for a shilling and a half a day. They were well fed by the mine owners, but their families were practically starving on the scanty crops. Prices of imported food rose rapidly and the small wage the head of the family sent home was entirely insufficient.

While we were there, severe riots took place. The British tried to say that Communists were back of the riots; many of the African laborers were killed. The Commission finally sent from London to investigate confessed they found no evidence of Communist influence, but they did not grasp that hunger and food shortages and high prices were back of the trouble.

Many times I have said that "politics are the smoke that rises from and hides the fires that are burning at the ground level." The fires that are burning all over this part of Africa

WCL: on the ground level are caused by populations increasing faster than food supplies. It is totally impossible for shifting agriculture to increase food production.

But the recent rapid increase in population which was overtaxing the food supply was due in part to paternal colonial government's prevention of tribal warfare, slave raids, ritual murders and slaughter, sometimes of hundreds at the death of a Chief, and feeding populations in time of need by importing food, and, with medicine, keeping alive those who would otherwise die.

Chall: Then it appears that the coming of the white man has not been altogether a blessing?

WCL: I often said to the missionaries and government officials that they had put the "cart before the horse," for they had devised so many ways which had increased population, before they had provided methods to increase production of foods for the new hungry mouths to be fed.

I attended a large conference of missionaries and African ministers and explained to them this story of decreasing productivity by present farming methods. One minister rose and said, "Now, for the first time, we know why it is that hunger already done catch us."

Suggestions for Increasing Food Production

Chall: What can be done to help the African increase food production?

WCL: The African of the tropics needs special help. He needs financing, and he must have demonstrations, for he will not change his traditional ways unless he sees for himself that another way is better, and even then there are many problems and obstructions.

Fertilizer

WCL: If land is to be cultivated continuously, there must be sufficient fertilizer and this the native African did not have. He realized that crops grown immediately around his hut or kraal, where his family return to the ground the night soil from food they have eaten, grew well year after year, while further removed

WCL: crops were scanty.

The great problem here was improvement in fertility of tropical soils, and here the native African needed help which he had not yet received. Entirely too little had been done to solve this problem. There had to be provided means of composting--of growing legumes and plowing them under--but many agricultural officers maintained that this could not be done in the tropics, that they would burn up and disappear too quickly. But I found layers of humus twelve inches in depth in undisturbed spots around trees of the forest.

These leached out lands also needed the addition of nitrogen and phosphates. Around the coast of Africa in Morocco are some of the largest phosphate deposits in the world. West Africa has vast unused water power available for the production of nitrogen.

This hot house of the world with its sand culture had, and still has, of course, enormous potential possibilities for increased production, but the native African needed the advantage and training in the technical knowledge and efficiency of the white man. He could not do it alone.

Roads, Railroads, Machinery

WCL: In all of tropical British West Africa, I did not find a half-dozen plows. There was no animal power to pull them and no fields large enough on which to do mechanized farming. Machines rusted in the field wherever they had been given to the African. Mechanized farming could have been developed in the northern sections which were much better adapted to growing food than the rain forests of the southern portion. But here again, transportation was the problem.

Chall: What kind of transportation did they have?

WCL: The British had built dirt roads so that one could travel to most places by auto. There were some trucks, fitted with boards for seats across the bed, onto which natives packed themselves like sardines. After the bicycle was introduced, it became a status symbol and a great luxury.

The method since time immemorial was head transportation, which may have proved the best on forest paths, because it could free hands to push aside branches, but today it is of course slow and inefficient and actually very expensive. I figured it was twenty-five times as expensive per ton mile for freight as in the United States.

One man or woman could travel only fifteen miles a day,

WCL: carrying sixty pounds on his head. For this, he was paid two shillings. In all the thousands of head loads we saw being carried, we never saw one fall. Even children run to school with their books and ink bottles on top of their heads. This makes for straight, graceful figures, especially among the women. Women carried baskets of two hundred eggs on their heads at times.

We wasted much time waiting for ferries pulled by human muscle to cross rivers for only few bridges had been built.

Chall: Did you suggest to the governments specific things they would do?

WCL: Yes. Instead of allowing rain waters to rush out of the area, I suggested that valley bottoms of heavy soils be leveled and diked to hold water for growing rice. Slopes, I said, could be contoured with channels to make use of the moisture absorbed into the ground from water standing in the channels. Land between channels could be used for dry farming or pasture.

This method of farming these innumerable little valleys would provide food for local peoples and give a surplus for purchasing power. But powered machinery would be necessary. The first step would have to be extensive use of oxen- or tractor-drawn farm machinery, and the government would need to provide heavy earth-moving equipment to make the original contour layouts of land.

At Kano, in northern Nigeria, I found enormous pyramids of shelled and sacked peanuts, which grow well in sandy soils of northern territories, yet they were spoiling for lack of rolling stock on the one railway to get them from Kano down to the coast, and because of the inefficiency of railway employees who doubled or trebled the time enroute.

They stopped to buy eggs, chickens, cereals and the like, produced in the north, which they sold then to the food-poor populations of the forest areas along the coast. On the return trip, they sold cloth and other articles from the coast to the peoples in the north. We rode this train for twelve hours on a trip which should have taken but a third of the time, if it had been run efficiently for the railroad rather than for the profit of every one from the engineer down.

Increase Prices

WCL: I said to the British officials if they would increase the price to the farmer growing peanuts only two cents per pound, these northern territories could grow all the peanuts and oil

WCL: for the British Islands. They wouldn't need to waste huge sums as they had on the ill-fated "ground-nut" scheme in Tanganyika.

Cooperatives

WCL: One of the great problems of native farming near the coast in British West Africa was the excessive fragmentation of land into small plots along with the problem of fertility maintenance; whereas in the northern territories, the land was suitable for mechanized farming and excellent for large-scale food production, but people were poor, backward and reactionary, especially in northern Nigeria where most people are Mohammedans.

There was also the need for efficient rail transportation to the coast. Development of these excellent farming lands should be done by cooperatives to develop initiative of peoples in carrying out these works, aided by government works and technical staff.

But no such plans were in existence on the part of any government authorities with whom I talked. I found nothing was being done to give these people sufficient food for themselves, let alone provide for increased production of foods for export to give them purchasing power that would give them some of the good things of life for themselves.

Colonial Policies Retard Progress in Agriculture

Chall: Why was the British government not doing more to improve native agriculture?

WCL: Each colony had a few British agricultural officers. They were earnest, hard-working men and eager to do a worthwhile job, but everywhere we found them frustrated by things over which they had no control. Many were trying to do their work under appalling handicaps.

They were handicapped by an entirely inadequate staff. Also, English climate and land problems were completely different, and the agricultural officers had had little training in tropical problems, and knew little about erosion or proper land layouts. They were lacking in basic data and had no land classification inventories made for indicating best uses for various types of land.

WCL: Individual extension officers, running here and there with little isolated ridging or contouring demonstrations, were getting nowhere. Some of the demonstrations were little different from the adjoining native African fields. Some were eroding badly. Good intentions and talk does not impress the African.

In my opinion, agricultural experts should have been concentrated in demonstration areas of five to ten thousand acres where an expert job in the integration of all phases of tropical land problems could have served as pilot projects.

Another great handicap of government agricultural officers was that they were allowed a furlough back to England every eighteen months, so that there was not time enough to gain the confidence of the African. Often no one took his place for a time. He was not allowed to return to the same place if he wanted a raise in salary. The African was suspicious until personal contact established confidence, so he did not adjust to changed British personnel every eighteen months.

Chall: Did you see any good work accomplished?

WCL: The two finest pieces of work I found in all British Africa were done by Dr. Emory Alvord, a Mormon missionary whom the government of Southern Rhodesia employed, and who stayed on the same job for twenty-five years, and Mr. Collete of Basutoland, who continued his same work for about fifteen years and had done the finest work in erosion control anywhere in Africa.

But when the policy is no promotion without a move, agricultural officers could not be expected to remain on the same job for the sake of the work when they had to support children or prepare for retirement.

From what I saw, agricultural officers did not get adequate support from senior administrative officers, who were often too obsessed by political considerations of the moment. More attention was given to politics and not enough to food. Agricultural officers were also handicapped by poor transportation facilities and wasted much time and energy on foot or truck, getting around their districts. At the same time, they had to do all their own desk work.

Of course, the greatest hindrance of all to the increase in food production was the African farmer himself.

Analysis of the African as a Farmer

Chall: Why should the African farmer resist the introduction of new methods to increase food production for himself and others?

WCL: This is a question to which I gave much thought in all ten British colonial areas. Based on much information, I came to certain conclusions: African lethargy, indifference, obstruction, passive resistance and sometimes outright hostility, along with tropical disease, coupled with Juju, or witchcraft, with all that it involves, was a terrific and frustrating handicap to progress. These factors would, I felt, prevent a change to modern ways which would be rapid enough to stave off inevitable malnutrition and starvation and the deterioration and destruction of land. Social unrest would be the result.

The heavy hand of the past fouled up all operations that involved farming the land. There was serious trouble ahead in Africa, but only a few realized the implications of the increasing food shortages to the stability of the colonies.

Male-Female Roles

WCL: I should like to discuss in some detail why I thought the African farmer did not more readily take on modern methods of farming, even when he knew it was to his advantage to do so.

First, the native African, from stone age time to the twentieth century, has been primarily a nomad, a hunter and a warrior. Work for him was not in the social set-up.

Among the thirty million Negroes of British West Africa, the man chopped down the bush, or trees, and burned them at the end of the dry season for a fertilizer dressing of ash. The wives then scratched the earth with their primitive short-handled hoe and planted seeds among the stumps or fallen limbs. They hoed weeds and harvested the crops, a stalk at a time, as each different crop ripened.

When he needed more food, the African bought or raided other tribes to secure more wives to produce extra food. He had no responsibility for growing food or supporting his family. Each wife must produce her share of food for her husband, his parties and beer. Woman's status being inferior, the male was unwilling to do the work allocated to women: planting, hoeing, weeding and most of the harvesting.

WCL: Since women did most of the farm work and were more ignorant and reactionary than the men, they could not easily be changed into modern conservation farmers. However, in a very few areas where I found that plows had been introduced, I learned that when women had seen how their back-breaking tasks could be lessened, and that with the plow the men would do the work, that wives nagged, cajoled or ridiculed their husbands until they bought plows.

One Chief, in northern Gold Coast (Ghana), was able to plow so much more land that he increased his annual production ten times. He was rapidly growing rich because when the usual famine was on before rains he sold his big surplus at high prices.

Witchcraft

WCL: A second reason why the African farmers were so slow to take on modern methods was caused by the heavy hand of the past, sometimes called "the dead weight of Africa," that grips with fear all the great illiterate masses and hangs heavy over all farming operations.

It would appear that African agriculture was very simple. But African agriculture is not simple because every operation in farming the soil is related to taboos, superstitious customs, witchery and spirits.

They sowed the seeds and then trusted to witch doctors, rainmakers, and spirits to do the rest. If drought, locusts, disease, windstorms or floods came, it meant the spirits were displeased or some enemy had bewitched the land or crops. The African feared ancestral spirits would be angry and allow disaster to befall him, his family or his crops, if he should change traditional farming for modern ways.

If one member produced better crops or accomplished more, the farmer was credited with having some secret formula of witchery. Often the Chief ordered his henchmen to punish good farmers.

Various missionaries told of energetic farmers who had excelled in production above any in the village. They were falsely accused, taken to court and the extra crops taken from them. This was mild punishment, for we were told of other instances when such farmers had been convicted of witchery and condemned to die or receive a curse from the witch doctor, a fate as terrible to the native African as death itself.

We heard of other cases where the successful farmers had been assigned the following year to the poorest, most remote and

WCL: difficult lands. This crushing of individual initiative stifled progress and private enterprise, wasting one of the greatest national assets--the initiative of peoples, individually and en masse.

Tribal Chiefs

Chall: I should think the Chiefs would encourage progress for the sake of more production for the tribe.

WCL: No, for with few exceptions, Chiefs were a powerful reactionary force, and they were venerated in spite of ignorance or wantonness. They exerted vast powers. By custom, the Chief and elders allotted parcels of land, and if they chose to do so, they could crush individual initiative by denying land or by allocating poor land to those who opposed them.

They resisted change in land tenure or tribal law that might deprive them of their arbitrary powers. They were largely responsible for the annual burning that caused almost all of black Africa to be aflame in spite of government's efforts to stop it.

But the British, in their policy of indirect rule, sanctioned the position of power to African Chiefs, even though the Chiefs obstructed government efforts to help them.

Chiefs usually were suspicious of trained Africans with knowledge and technical know-how, so instead of enlisting their cooperation, they more often alienated or liquidated them. They clung to old ways and would not let a possible competitor arise to challenge their own strength, position or influence.

A Catholic Father in Swaziland told me of a native Christian who did excellent work on the school farm and began to put these conservation measures on his own family tribal lands. He was warned that the Chief was displeased and he had better stop those foreign methods. A few days after reporting a second warning, the boy was poisoned and died.

A Protestant missionary in Basutoland told us of a mission-trained boy who was delighted with the first heavy rains and, being ambitious and energetic, took out his oxen and began to plow before his Chief had started. The boy was called before the Chief and his elders and fined five cows, a staggering burden for a young man who did not make more than thirty cents a day. These five cows represented the purchase price of a wife in Africa south of the equator.

WCL: In various places throughout the colonies, missionaries told us of young men on their school farms who did good conservation farming under their direction, but when they farmed their own tribal lands, they plowed up and down slopes, they left out grass strips, and did nothing to stop gullies.

They did not plant trees, even though they wanted to, because they feared the Heavy Hand of the Past would reach out and destroy them and their efforts. The hold of Chiefs and witchcraft in most parts of Africa south of the Sahara continues very strong, and is exceedingly difficult to dig out, in spite of much instruction and Christianity.

In August, 1967, I talked with an F.A.O. man from Nigeria, who said that an African trained at the Lowdermilk School of Agriculture in Israel returned to his tribe and village. He only ate eggs because he feared he would be poisoned for his knowledge which was different from that of his Chief.

Tree planting had special problems. If natives in south and east British colonies were persuaded to plant trees, or government did it for them, Chiefs often made farmers either pull up the trees or plant them on less desirable land. When I asked some native farmers in Basutoland why they did not plant trees for fuel instead of using cow dung, they replied, "We dare not do it." Also, the African is easy-going, and tree growing was difficult for he had to protect trees from the hungry mouths of sheep, goats and cattle until branches grew beyond reach.

Chall: Were all Chiefs reactionary or did you find some progressive ones?

WCL: Yes. I often talked with Chiefs who agreed with us about the need for change: for better methods of land tenure and grazing control; for measures to prevent erosion and to curb annual fires; for trees to use as fuel instead of cow dung so badly needed for fertilizer.

Yet when it came to actually carrying out these improvements, the same so-called progressive Chiefs stalled, and refused government help.

Lack of Personal Responsibility for Land

Chall: This must have been most frustrating to missionaries and government officials trying to help the native farmer help himself.

WCL: Yes, it was tragic that the African farmer lacked a sense of

WCL: responsibility for his lands. There were definite reasons for this. The farmer was allotted farm fields usually for a two-year period of cultivation after which the land reverted to the Chief for bush fallow. Then after ten to twenty years, when they came back to the same area, the land was allotted to someone else. The farmer was not likely ever again to farm the same piece of land.

Also, the farmer's children would not inherit the land or its improvements, so none were made. For this reason, farmers resisted planting fruit trees, except banana or papaya, which produce quickly, for they would not be the ones to eat the fruit.

While the African has a powerful attachment to tribal lands and will fight over land quicker than anything else, they seem to have no idea of responsibility for any one piece of land. The African had no idea that the right to use land also brings responsibility to take care of the land.

Furthermore, the farmer did not take responsibility to provide for the future of his children and grandchildren. When I was urging a farmer to take measures to stop erosion on his rapidly deteriorating sloping field, for the sake of those who would come after him, he definitely was not interested and said, "Our fathers did not do anything for us so why should we do anything for our children?"

The African farmer lived from day to day and crop to crop. He ate when he had food and starved when he did not. He has never had the idea of being provident and storing up for emergency as did our European forefathers. The African climate is mild, shelters are easily made out of materials at hand, and before the white man came, food was sufficient for less populations.

Chall: Could the colonial government, by laws, force the natives to adopt modern agricultural practices?

WCL: Government may have had a good program for preventive and remedial measures against soil erosion, or rotational grazing in order to save the range, or reduction of useless livestock which were only used for buying wives; or government may have planted trees on eroded hills or in gullies to ease flood damage; or in other areas work out rotations, composting, strip-cropping, contouring. But with few isolated exceptions, compliance by natives thus far was disappointing. Africans who copied and carried out the good examples on their own initiative were almost unknown as far as we could find.

I thought it wrong that natives seemed to have the idea that government accepted the obligation to provide such benefits

WCL: without corresponding obligation of responsibility on the part of the African. The English government could command compliance and perhaps get it, as long as the white man closely supervised, but it could not command cooperation.

Africans needed to cooperate for their own sakes and for the future of their peoples. Something, I argued, had to be done to make millions of farmers take responsibility quickly, and with energy, to cooperate with government before it was too late to save their lands and food supply.

Mistrust of Government

Chall: Did you discover what, aside from their culture, brought about this outright obstruction to all efforts of government to help the African?

WCL: Yes. It was well-known and recognized by missionaries, government officials and all Europeans working in black Africa. The deep-seated reasons for this lack of cooperation or outright obstruction which prevented African farmers from taking on modern methods was suspicion of government and of everything it proposed to do regarding land and farming.

This was reiterated to us again and again in every colony or protectorate we visited. This suspicion was not against any one person in government but was an attitude of mind, a psychological fixation of mind to resist or resent or obstruct any suggestions or demands of government on the native.

For instance, in Basutoland and Swaziland, south of the equator, where great numbers of useless cattle destroyed the range lands and were used only as "Labola," or to buy wives, the natives distrusted the cattle-dips, which were maintained at government expense because dipping was enforced to reduce animal diseases. Natives refused to recognize the benefits to their cattle, and thus to themselves, but insisted that enforcement was so government could count their cattle and either take part of them or force the native to sell some which the government considered surplus.

This actually was necessary at times to save the range and prevent starvation of cattle, for it was overstocked with old and useless cattle, used only for buying wives.

They also suspected that all conservation measures were devices of the government to limit lands for natives and to increase land for the white man. Or again, if they did the work

WCL: and carried out conservation measures as the government strongly urged, then they believed the land would be taken away from them to benefit white farmers. They had absolutely no confidence in the good intentions of government, but only deep-seated suspicion and seething resentments over past injustices.

The hard core problem for the white man even today as he tries to do something for the native African is to make the black man believe in his good intentions and sincerity. It seems to all concerned that instead of increasing cooperation between the races, the African Negro is responding less and less in cooperation.

Mistrust of the White Man

Chall: Do you think the African had good reason to doubt the sincerity of the white man?

WCL: Of course. Until recent times, the black man had reason to feel the white man had given his country a raw deal on land and resources. Some of these gripes were expressed to us over and over again.

The idea was, "How can we ever have prosperity and become a prosperous nation when the British government claims that everything our country has of value in minerals, ivory, our finest timber, is all 'vested in the Crown'? They get our wealth and what we get is a small tax and starvation wages for doing all the work. We want bridges and roads, machines and other things, but we are told that the country is too poor and has no money to do the things we want."

Certainly, the evidence indicated that the wealth of the countries had poured out to the British Islands and the natives had been left as subsistence farmers or laborers at one shilling and a half a day. Colonial government in the past generally thought of colonies and protectorates in terms of cheap labor to extract raw resources for export to the mother country. Colonies were operated strictly for profit.

Quite suddenly, on top of this former policy, the British added this new concern for the advancement of the native and improvement of his lands. The suspicious African refused to believe that government was now sincere in its desire to help, but instead believed that the British government must have had some ulterior motive, something having to do with advantage to the white man.

WCL: In my opinion, that new policy of assisting the African and the country to achieve prosperity, and to give him purchasing power to buy more of the things England had to sell, would have brought far greater benefits to England and the colony than the old policies.

In special areas where natives already had purchasing power, as in the cocoa-growing lands of British West Africa, England could scarcely supply all their demands for imports. One bicycle shop in Accra, Ghana, had a backlog of orders for more than a thousand bicycles. Lories were in demand far beyond the supply. Tractors and farm machinery could not be bought at any price; even agricultural experiment stations had difficulty in getting them.

I saw many areas where trouble lay ahead. On the implementation of that policy, for instance, in northern Nigeria the tin mining concessions were progressively making farm fields into heaps and piles of yellow earth, disgorged from the tin mines. The value of ten years of crops was paid to the villagers for their land. But this was an irretrievable loss of food lands in the life of a people increasing rapidly in population.

However, the mine concessions were beginning to take promising sons of these farmers and were training them to be semi-skilled workers in the mines. This would give the area some purchasing power to buy food elsewhere, if or where surplus food is grown, and could alleviate some of the food shortage caused by these extensive mining operations.

Chall: Did the native African farmer, at the time you knew him, feel that he could do the same as the white man if only he had an equal chance?

WCL: No, I do not believe so, for the African has an inferiority complex that is very real and holds him back from taking over modern methods readily. He was slow to learn and knew it. He was slow to give up his traditional manner of life and work.

How, I wondered, can he jump from an early iron age way of life in one great leap across the centuries into our western way of life, which is the culmination of centuries of tedious effort and struggle? These complex problems, beyond the immediate capabilities of the African, would only add to his frustrations and deep feelings of inferiority.

The vast discrepancies between whites and blacks were appalling, and further convinced the African that the white man was there to grow rich on his country's resources and his labor. He saw the white man living under conditions of special privilege which he could never attain.

WCL: The splendor of the huge and often bombastic buildings of the white man, his aloofness, had created too great a gulf for the native to bridge. With all mineral and other wealth taken over by the Crown, the African knew that never, on his subsistence lands and low wages, could he attain sufficient wealth to have what the white man had.

He did not have the capital, or the know-how, or the skills. He professed not to like or want our civilization, but he wanted the bicycles and certain other appurtenances of our modern living, whenever he could afford them.

In my opinion, this suspicion of the white man could be overcome only very slowly and with much patience on the part of the white man, and doubtless with considerable financial cost to himself. He will have to cease being aloof and superior and work with the African; then gradually, the black man may overcome his suspicions and cooperate.

Education: Inadequate and Misdirected

Chall: Did you think that the goal of the African was to become like the white man?

WCL: Yes, and herein the white man has done great harm by setting a totally wrong example or goal for the African. When he first came to Africa, south of the Sahara, he felt he must gain the respect of the African by being waited on and doing no work. The white man sat at a desk or in an administrative job and had others do the physical work.

All white men who came had an education. This seemed to give them superiority and the right to do no work. Therefore, the ideal, the goal for the African student, was to get some education to release him from manual labor. Farming is hard work, especially in Africa with primitive tools and subsistence farming.

When students returned to their tribal lands or to the reserves, they did not express their education in improving farming methods or tools, but rather in doing nothing and being waited upon. The white man did not work or do farm labor, so the student felt it beneath his standing to work with his hands.

Chall: It appears then that education in Africa also has worked against progress for the native farmer.

WCL: Yes, I consider that it has. For from the very beginning,

WCL: education has laid the emphasis on white collar jobs and workers. Missions needed teachers, and government and commercial enterprises needed clerks to carry on routine jobs.

The goal of ambitious students was to pass the Cambridge examinations and many became able doctors, lawyers, judges, clerks and politicians. But no attempt was made to train engineers and educated skilled artisans to work with their hands and glory in it, to do the many productive enterprises needful for a growing society.

Educated Africans have never considered agriculture as a vocation or tried to improve implements, tools or methods. Since growing of food was considered beneath the educated man, the African farmer has been left without the assistance of science and technology which should have come from teachers and trained students.

Chall: Was government doing much to educate the African?

WCL: No. The northern territories of the British West African colonies were very backward. There had been few attempts at education or native improvements, and these few were sad in comparison with the more progressive peoples in the coastal areas where education had begun years before with the missionaries.

There was such a contrast in Gold Coast (Ghana) in the condition of the peoples, north and south, we asked the reason. We were told that the High Commissioner here for years in northern territory did not believe in missions or in education of the African and did not permit it in his territories. This accounted for the striking difference in the native peoples and their lethargy and backwardness in this northern Ghana.

Chall: You spoke of education as failing to fit the African to his changing life. Will you enlarge on this point?

WCL: Yes, for I felt that an Africa of ugly problems was rising out of the inadequate policy of education for the native African as it had been carried on by government and by missions, which government subsidized and made responsible for most of the task of education under prescribed courses of study.

There was need for a change in educational policy which would be revolutionary, but even that would be less disturbing or disastrous than a continuation of the trends I saw in 1949-1950.

Education as it began to be carried out was not adapted to fit the African to his changing life, from a primitive social order to one of many divisions of labor in a growing society with enlarging demands. Rather, African education was adapted

WCL: to fill the needs of vested interests. Missions needed teachers, and government and commercial enterprises required clerks to lift the routine burdens from the white man. The result was to emphasize education for white collar jobs.

Emphasis on Administration, Not Land Development

WCL: The basic profession of a nation, that of efficient food production as the only secure foundation on which to build a superstructure of many divisions of labor, had been ignored. Neither were African students trained in the many skills and productive enterprises needed in a growing society. Educated minds and trained hands and muscle were not brought together. The white man did not teach or give the African student an example of the dignity of labor.

I spoke to many thousands of African high school and college students. Always, I asked for a show of hands to see how many were preparing to be doctors, lawyers, politicians, teachers or clerks. All hands went up in one of these categories.

When I asked how many planned to be civil engineers, mechanical or electrical engineers, or agricultural engineers to develop power farming to increase food production, or irrigation and drainage engineers, or to be modern conservation farmers, not a hand went up.

Then I would ask, "Is anyone going into any kind of productive enterprise to make useful things the people of the country need: to make carts to haul produce, and do away with the expensive and inefficient head transportation of British West Africa; or to build bridges across rivers to replace the tedious crossing by man-propelled rafts; or to build roads; or make improved tools for the poor farmer who has had to struggle alone, without help, because students will not put their trained minds and hands to the plow?"

Not once, among the thousands of students in West Africa, was a hand raised, and it was almost as bad in Africa south of the equator. I said to all these students, "Everywhere I hear you clamoring for self-government, which you call S.G., but no secure superstructure can be built on politicians, lawyers, teachers, doctors and clerks. Political self-rule without economic self-support will bring chaos and disaster."

Repeatedly, I emphasized that when one constructs a building, he does not build the roof first, but rather a firm foundation. The only foundation on which a nation or a people can build a superstructure of society that will stand is a firm foundation of efficient food production per acre and per man and with great

WCL: numbers of trained and skilled workers to carry on the productive services required in a growing society.

Problems of Under-educated Youth

WCL: All these years, government and missions had turned out many, many Standard Six boys--equivalent to our eighth grade--who had not been taught the dignity of labor, and had not been trained to make anything, to produce anything, or to grow anything. For these, there were few white collar jobs left in government or commercial houses, and few jobs for school teachers.

These unemployed boys were a growing and dangerous element. They flocked to port cities or large interior cities where they eked out an existence by questionable means. Many were idle. They would accept nothing but white collar jobs.

They became centers of social unrest and agitation for any political scheme that would give them a chance at benefits that might fall to them in disturbances. They were frustrated and without means of making an honorable living. They were festering sore spots most susceptible to Communist propaganda. One official said to me, "Something must be wrong with our education, for we shall have to build more jails to take the products of our schools."

While in Nigeria and Ghana, we were told that most of the disturbances then taking place could be traced to these semi-educated boys for whom there were no jobs, and who now felt above manual labor. This situation was not confined to British West Africa, but to a more or less degree in every British Colony or Protectorate we visited.

It is understandable why Standard Six boys did not return from school to their homes to take up the subsistence farming of their fathers, with primitive tools and methods. They would have no purchasing power to buy the things they craved.

Only an agriculture of the future, with promise of prosperity brought by machines and power, had any prospects of doing so, and then only as there was a radical change in the emphasis of teaching, which heretofore had ignored or disparaged farming as a profession. It is most unfortunate that the white man should have implanted in his education this false conception toward the most basic occupation of mankind--that of growing food for the nation.

Suggestions for Improving Education

Chall: You paint a pretty black picture. Did you give missionaries and government teachers any program that you felt might improve the early education of Africans?

WCL: Yes. Over and over, I gave a brief outline of a course of study that would integrate the native into his environment rather than out of it.

(1) Let us begin with the village school and its locality. Let students draw maps of the village, its places of interest, its well or water hole, its meeting places, where dances are held, location of the village church, its sacred grove, its market place. Have students count the number of people in the village who can work and those who need to have others support them. Map the size of their village lands (at first, omit ownership), the acreage on which the number of souls in the village must depend for making a living, for food and clothing.

Map the roads leading off to market towns or cities. List the essential food crops which can be produced in or around the village, and the ones which they must buy elsewhere. Discuss the relation between villages and larger trading centers with their mutual need of each other. This can lead on and on into transportation and communication and trade as far as desired.

In all discussions, students should be led to find ways to improve the things they do and the things they have, to stimulate individual initiative. Especially stress the necessity for efficiency in production of more food and care of the land that grows the food. The greatness of industrial countries that have so many things the African is beginning to want has grown out of farmer efficiency.

As an example: when the United States was a young country two hundred years ago, there were ninety farm families in every one hundred families of the country. There were only ten families left to carry on the government and to render services to the superstructure of our rural society.

Little by little, the American farmer became more and more efficient, so that today, out of one hundred families, it takes only six families to grow our foodstuffs for the one hundred families, besides all our surplus for export. This leaves ninety-four families within the hundred to provide transportation, industries, education, sanitation, and many types of services for our complex modern society.

(2) Begin to teach the young students about soil and crops.

WCL: What kind of soil is their village dependent upon to supply its needs? Is the soil clay, loam or sand; is it alluvial or rocky land? Show the pupils how to collect samples of soils and to study them. Teach of its microscopic life and why only the top "skin," or few inches of topsoil, will grow food. If this fertile covering of the earth is lost by the farmers' neglect, people starve or have to move on to other places, for there is no substitute for food.

Have the students make lists of what their particular soil and locality will grow. How much food is needed to make people strong and able to work? Teach about foods: vitamins, and how crops have more nourishment when the soil is good than when fertility is washed away or used up; how vegetables must get all their nourishment from the top few inches, while fruit tree crops have plant foods which the tree roots "mine" from deep ground and put into fruit for us.

Discuss with the students how many meals a day the people of their village eat. Do they get enough? Can their village grow all the kinds of food needed for all the people. Emphasize efficient farming as the basic profession, and its importance for all people, city as well as village. Emphasize needs of foodstuffs and pure water.

I shall never forget a bright village school boy I met and asked what he wanted to be. He replied, "A clerk." I asked him if his father was a farmer and he replied, "Yes."

I then said, "Why do you not study to be a modern farmer and grow lots of food?" He quickly replied, "Oh no, farming is not important."

Then I said, "Tell your mother not to give you any yams or food tonight for supper, because food comes from farms and farming is not important, you say."

This study of the soil and what it grows can go on into nutrition and health, botany, geography or agriculture, as desired.

(3) Take up climate, rains and winds. Let the students measure the rain, study the rain drops and what happens to them when they hit the ground. Study how streamlets form streams and rivers when more rain falls than the ground can absorb. Watch how running water moves rocks and earth.

Students should examine rain water running across their own farm fields as it carries away top fertile soil that makes food crops grow. Put some of this muddy water in a glass jar, or whatever containers they have, and let it settle to see the amount of their food-growing soil that was washed away, even in that small

WCL: amount of water. Explain how lands fail to grow food when this soil erosion has stolen and carried away their good earth.

Discuss the wind--why it blows, whence it comes and where it goes. Help children to learn direction of winds and how some winds bring moisture from the ocean and drop it as "blessings from heaven " on land and on trees and plants, but as damage to the land unless the farmer provides protection from soil erosion.

These studies of climate, wind and rain can go on into soil and water conservation to any length desired or into climate, meteorology and hydrology.

(4) Take up the family, clan, tribe and the customs. Discuss formation finally into a nation: what is needed to become a nation, unity of language, customs, education, loyalty, responsibility, patriotism and such. Discuss the relationship between families, tribes and nations and their interdependence. Discuss the responsibilities of various groups--how families and groups must give mutual help: children support aged and strong take care of helpless or weak. This could lead into sociology or into history.

(5) Consider Religion and the Church. What are their native beliefs which show a need of or their realization of a Supreme Being? Compare the good points of their beliefs with those of Christianity. What are some of the things the church can do for them? Especially, should the "Golden Rule," or "Do unto others as you would have others do unto you," be stressed. For Africans are noticeably lacking in social responsibility, social justice and human sympathy or mercy for those outside their immediate group, and often fail even here. How can the African student draw on spiritual forces and relate himself to the Universe and find his place in the scheme of things for everyday living?

(6) Take up pets and animals of the community. Have the children make lists of those near them. Which ones are harmful and which are not? Have students collect insects and tell what they know about them. I have found natives have a remarkable store of traditional information handed down from generation to generation.

Education has not given sufficient recognition of the knowledge of plants and animals and their native names which Africans have. Build on this information of folk lore. Above all, lay emphasis on less cruelty to animals, which is one of the sad things one sees in Africa. All these studies can lead on into zoology and biology as far as desired.

(7) Plan a Land Use Pilot Project, in a small way. Explain

WCL: the interrelation of each one's activity and how more divisions of labor are needed as society develops and needs more things. Show how nations and civilizations grow on divisions of labor and interdependence on these divisions of labor. Discuss the divisions of labor in the village. Do more than just give an idea of jobs. Develop the idea of the contribution and responsibility of the immediate group to a combination of groups to make up a nation.

There was no unity of tribes or language or religion to make a stable nation out of the colonies and protectorates which were all clamoring for independence and self-government.

Summary of Suggestions

WCL: Instead of training the African student out of his environment, and with no sense of responsibility to others, if he could go through this foundation training, along with reading, writing and arithmetic, he undoubtedly would have a keener realization of the basic social structure and have a sense of responsibility and importance in doing his part in one of the many divisions of labor.

Instead of a little education turning his head, he might realize how much there is to learn. Such a training, I hoped, would diminish the frustrations of Standard Six boys, who would find many tasks of dignity in a combination of mind and hand in needful skills. Then the African native students would begin to realize satisfactions in doing the many kinds of labor needed to make a stable foundation on which to build the prosperous self-government and national life they wanted.

Of course, textbooks would have to be written first for each of the above chapters or divisions of study, to teach the teacher as well as the children, and I urged that this be done both to missionaries as well as government officers for education in the colonies and protectorates. This called for a lot of conscientious work.

Chall: This outline for study would certainly give the African school children a basic foundation of knowledge that would incorporate them into all phases of local and national life. Did any agree to start this type of education for the African village schools?

WCL: Well, all with whom I talked agreed that this would be a splendid approach to a change-over in type of education, but it was not one that could be begun without textbooks and teaching methods and trained teachers, and this would take time. The entire clamor was for self-government--which came much too soon--and I doubt that anything has been done yet to modernize education

WCL: for the native African child of school age.

Conclusions Regarding the African as a Farmer

Chall: After your years of working with the Chinese farmer, you had very definite conclusions regarding his ability and treatment of his farm fields. Did you come to definite conclusions also about the African farmer, south of the Sahara?

WCL: Yes, I did. After many years of experience with farmers of many countries--including the Chinese and other oriental farmers, and those also in North Africa and the Middle East, and a year of study of native farmers in West, South, Central and parts of East Africa--I reluctantly came to the conclusion that the African is not by nature a farmer.

Furthermore, psychological attitudes of suspicion, hostility and lack of cooperation with government agricultural officers trying to help them, and their inability to go ahead on their own after modern methods proved they could double and treble their crops, convinced me the African native farmer could not be made into a conservation farmer in time to save the lands which his traditional farming practices were destroying at an alarming rate.

This is all the more tragic because of increasing pressures on the land for food for populations that are doubling in twenty-five to thirty-five years. It would do the African no ultimate good to give him more land to destroy by traditional farm practices, or to give him another subsistence farm on which to exist with no purchasing power or means by which he could improve his conditions.

But the African, in my opinion, has a right to a better way of life and a higher standard of living. For those Africans who wished to farm and would cooperate willingly with government and agricultural officers to carry out up-to-date agricultural and conservation methods, well and good. They should remain on the land as independent farmers.

But for those who do not wish to farm with modern methods and to safeguard their lands, there must be jobs in industries of many kinds where supervision could be continuous until the native became skilled in many trades. The African has proved himself capable of this type of work and enjoys doing the same job over and over again in industry which is boring to white labor.

WCL: The young African male south of the equator where white populations were numerous much preferred to work in industry, or in mines, or in transportation, or do kinds of labor on farms of white settlers, than to do traditional subsistence farming.

We were told by government officials that a quarter of a million of the able-bodied manpower of each of the protectorates of Swaziland, Basutoland and Nyasaland, annually left their own countries to work in adjoining states, where large populations of white people provided work in industries of many kinds as well as on farms.

Many went to Southern Rhodesia where there were more jobs than there were workers to fill them. Many went to the gold and diamond mines of South Africa. The rich copper mines of Northern Rhodesia also provided many jobs for their own manpower, but still more industry was needed.

Above all, in my opinion, Africa, south of the equator but not in British West Africa, needed a large permanent white settlement of farmers who would turn the useless swamp lands into vast rice-producing areas using powered implements, to feed native populations as well as the people of the United Kingdom.

The African needs help. He cannot make a prosperous modern country by himself. Neither would the government be able to do it for him. The hope for the African, south of the equator, to develop the vast potential of his lands, waters and mineral resources to support many times the present population lies in an enormous increase in white settlement, for this is a white man's climate and topography for mechanized farming.

These countries need settlers who will make homes, and will work with their hands, and develop individual enterprises. They must not set themselves up as landlords to have the black man work for them, with black mentality and inefficiency, but must work with their own labor until they become skilled in modern ways.

A great influx of white settlers would bring in capital and industries and many thousands of smaller individual farms to provide prosperous countries in which the native African may find his place as a farmer, if he accepts modern methods, or as a farm helper, or in any of the many industries.

Of course, it is expected that the white settlers must also comply with basic requirements of full use with conservation as a condition for having the right to buy or use lands of the country. Furthermore, the huge land estates of absentee landlords where natives used the land without supervision should not be permitted in the new agriculture.

WCL: In Southern Rhodesia I rode through estates of one-half million acres. These lands were not being used beneficially. I also was shocked to see damaged lands of some mission stations. Cecil Rhodes believed missions were a rapid civilizing force and granted many thousands of acres to mission stations that would come to Rhodesia and establish themselves. On these lands, natives whose farm and grazing practices were ruinous to the land were often allowed to take up land as squatters.

One day, I was at a station being run by Sir Stafford Cripp's uncle, then an old man. I got madder and madder as I saw the ruination of good lands by these unsupervised native farmers. Forgetting that a large group of officials were along with me, including several newspaper men, I made the remark, "They may be preparing the souls of these people for heaven, but they are letting their soils go to hell."

The next day, a four-column headline in the largest paper in Rhodesia and also in South Africa read, "'Souls to Heaven, Soils to Hell'--so says the American soil's expert."

At least, we hoped this would lead to a better understanding of what was happening to many of these wonderful food-growing lands. So we cannot always blame the African farmer, for the white settlers and rulers and missionaries have not been alert to what was happening to the lands of Africa, or tried to do much about saving or improving them.

Chall: Your studies of African colonies at the middle of the twentieth century, just before they all received independence, gives a better understanding of the many problems facing the new emerging African nations.

WCL: Yes, these were the most strenuous studies we ever made--before or since. Each of the new colonies or protectorates kept us busy to the last night before leaving when I would give my report to government officials and the general public. Then, instead of having a few days to write reports and rest, we flew in a few hours, to the next colony and were met by a rested, eager group, who again led us on a strenuous tour to all areas.

After an exhausting month or more, we repeated the same process and in the entire year, having only two free weekends--one at the Zambewe ruins in Southern Rhodesia, and the other at Christmas time at Lake Nyasa in Nyasaland.

There is so much more I should like to say about each of these studies and the countries we visited. I wish we had time to go into all the questions and problems in detail, as well as some of the interesting experiences and memories.

Memorable Experiences of the Tour

Itu Leper Colony

Chall: What are some of these that you have in mind?

WCL: Well, an experience which I dreaded became a great inspiration. It was at the Itu Leper Colony in Nigeria that I saw Christianity in action as never before. It was the work and vision of Dr. and Mrs. MacDonald of the Scotland Missionary Society. It was the most efficient cooperative I have ever heard about and was a complete success and self-supporting.

It was a stirring experience to sit on the church platform and look out upon almost three thousand lepers, fitted into their pews so tightly it appeared a shoehorn must have been needed. This enormous church had been built entirely by leper hands, using mud, thatch and timbers--all materials from off their three thousand acre colony, which had been a useless swamp. An eighteen piece all-leper orchestra carried the congregational singing, played an offertory and led the youth choir.

In this remarkable cooperative, the model villages, farming, and industries were all cooperative, yet this vast institution provided for individual expression. All able to work had their own farms, and grew what they wished, but everyone also had a responsibility in the palm oil production and other things which made the colony self-supporting.

Work was done according to strength, but all did something that made them feel needed and useful. The stronger, younger ones were trained to give the medicines and treatments to weaker ones. They were one big helpful family.

The lepers built a canal so as to make it easier to travel from villages to farms in boats, which were made of trees hollowed out. They had abundant fish in the canals and the weaker members caught the fish with little effort but much enjoyment.

These lepers had the most up-to-date setup we had found in this part of the world. They had machine shops; a power plant, which the missionaries had made from an old engine boiler and discarded parts found elsewhere, provided electricity to run their own small industries. They processed their own palm oil, made soap with it, and a long list of other things they both used and exported.

All children were in school here, whereas not five percent

WCL: of children of school age were in school elsewhere. Every year they held a "Valedictory Service," where those cured were given a diploma, declaring them free of leprosy and wishing them God-speed. Practically all cases were cured in two to eight years, according to the condition when they entered.

They arrived outcasts, filthy and apathetic, from the outside world where they were unwanted everywhere. But they left with heads erect, clean and self-sufficient, to return to their villages, often the only ones who could read and write. Most had trades, and practically all became earnest Christians.

These lepers stood out as a leaven in this pagan land. It would be a wonderful thing for the country if this sort of thing could be done to give great numbers of the population, as well as the lepers, this better way of life.

Chall: This is certainly an interesting story; no wonder it is still a vivid memory.

WCL: Yes. There are so many vivid memories of travel, experiences with African ants and their ant cities, of which I have written and will put on file with you, and stories told us by missionaries, and some special honors bestowed on us by the Africans.

Chall: I think you should include two or three of these experiences.

Ashanti Chiefs Honor the Lowdermilks

WCL: Probably the greatest honor I ever received was given us at Efiduasi, Ghana, arranged and planned by Dr. Amissah, head of all the Methodist work of the region. On the green grass at the center of the college football field, a gaily decorated dais was prepared for us, to which we were escorted under a huge, gay umbrella, to shield us from the sun. On one side of the field was a block-long canopy of palms to cover some one thousand guests. On the other side were about twelve hundred students standing--from lower grades to college students--with their teachers, separated into their respective schools.

Facing us were the eight Chiefs of the Ashanti tribe, largest in Ghana, with their elders and musicians and retinue. All were garbed in the finery of their offices--elaborate gold rings and scepters, colorful native clothes, heavy with gold and spangled jewels. Over each Chief natives held enormous gay umbrellas, some twelve feet across, all rippling with ruffles and braid. The pageantry of it all was supreme.

WCL: While the musicians played, with a rhythm which made us want to sway with them, we walked across the field under our great red umbrella, and shook hands with the Chiefs and their elders, some fifty of them. Then we returned to our dais--then what a pageant!!

Led by the greatest Chief, they all came across the field to us--a striking array of every color, with their streaming, brilliant robes and gold decorations, under huge umbrellas. Retainers held up the robes and supported the sacred bodies of the Chiefs so they would not stumble and even held up the arms of the Chiefs when they shook hands with us, so as to conserve their precious energies.

However, when my wife found out that one of the Chiefs had eleven wives and forty-five children, and others had done about as well for themselves, she wondered if in domestic affairs they had also had their sacred strength shielded by having others take the burden from them.

The Chiefs gave us gifts of turkeys, eggs, yams and other foodstuffs. Of course, we could not take these with us, so we gave them to Rev. Amissah, President of the Wesley College, who had made all the arrangements for this huge affair to bring together more than three thousand of the Ashanti people, just to honor us: two American land conservationists who had come to see their country, and, they hoped, help them to know how to grow more food. Never have we been honored in so elaborate and colorful a manner. It was the most exciting and thrilling experience we ever had.

That afternoon, we were whisked away to a big reception in Kumasi, the inland capital of the Ashanti tribes. There were about 125 Europeans and highly educated Africans, with representative people from government, missions, even Catholic nuns and priests, and highly educated natives. At the head table, we sat with the British High Commissioner and his wife. And honor of honors, I sat beside the Chief of all the other Chiefs, and my wife was seated beside the Queen Mother.

We were told that this was the finest affair that had ever been attempted in Kumasi. The art department of the college had made the elaborate place cards and provided all the colorful decorations. We shall never forget this remarkable day in British West Africa, in the heart of Ghana.

The Missing Corpse

Chall: It is too bad that you had no equipment to record this honor and pageant in movies.

WCL: Yes, it would be a fascinating documentary. Another experience was in Nigeria when we were house guests at the home of Bishop Vinnig, just after he had been asked to preach the funeral sermon for an important African at 4 P.M. When he reached the church, the funeral procession had not yet arrived. It was the custom for friends to escort the coffin, walking slowly, and if Christians, sing hymns.

Soon a breathless boy ran up and told the Bishop he must wait, for they could not find the corpse. "Not find the corpse!" said the Bishop. "How can I preach a funeral service if there is no corpse?" Great excitement prevailed, for law and custom is that burial must be the same day as death and in this hot climate, that is an excellent idea.

It turned out that the workers in the shop where the coffin had been ordered had done a slipshod job, put the corpse in it and gone home for the day. The shop owner saw the poor workmanship, and was ashamed his men had done this to a great African, and so ordered the casket taken to another shop, improved, and quickly painted.

These new men could not work well without removing the corpse, which they did, and placed it in a side room, and went home. When the relatives and friends gathered for the funeral procession, they found the casket light, looked in and discovered it empty--and pandemonium reigned.

No one knew anything about the corpse, which after all was the most important part of a funeral procession. Everyone ran wildly about, but did not think of looking into the back room until the workmen were located and came and produced the corpse.

The dignified procession then wound its way through the village streets to the church. The Bishop conducted services, befitting such a great man, and belatedly they all started for the cemetery outside the town. When they reached the cemetery, the gate was shut and padlocked for the night. Again there was a frantic hunt, this time for the gate keeper.

Finally after dark, the corpse of the great man at last found a permanent resting place. The Bishop remarked that he hoped his spirit did not have similar difficulties in locating St. Peter at the heavenly gate.

Life in a Mission Village

Chall: Being the guests of "old timers" in Africa certainly gave you interesting local color.

WCL: Yes. It was also fascinating to visit Pearl and Kenneth Prior, who were establishing a two thousand acre Village Improvement and Training Center at Asaba, in Nigeria. We had to delay our arrival for three days, for the driver ants, on the march, had decided to give their home a thorough house-cleaning.

When this happens, the owners pack a suitcase and leave, while the ants go in and out every crack, every straw and crevice in the thatch and no life is left--nothing escapes their millions of hungry jaws. This house-cleaning job was a relief to us, for we could go to sleep with no fears.

Mrs. Prior was a trained nurse. While there, two men on bicycles with a pole between them from which a crude hammock dangled, came up the forest road to their clearing and stopped. The woman was obviously a maternity case. Mrs. Prior, with a houseful of guests, went out to direct them to the hospital in Asaba, but at that moment there was a wail, and on the road was a protesting new baby. Mrs. Prior rushed into the house, got her equipment and properly delivered the baby.

She recognized twins were arriving and left the mother on the lawn while she took the baby in to bathe it. Shortly, she came out onto the porch with the little chocolate figure with kinky hair, but the yard was empty. The two men and woman had disappeared. Twins in some areas are a bad omen, and one must be disposed of.

Mrs. Prior quickly wrapped up the baby much like in pictures of storks delivering babies, and commandeered a Canadian bachelor to hurry on his bicycle with the baby and try to overtake the parents. After several miles, he caught up and called out, "Here, you forgot something." "Yes, we know, but we intended to come back in a couple of weeks."

So we got into the life of the missionaries and their work. The Priors were doing a wonderful work in this hot house of the world, but had no refrigeration whatever, and all food had to be thrown out at the end of the day. One of the happiest experiences we ever had was donating to the Priors a large Servel refrigerator, run with a small lamp, which enabled Mrs. Prior to have her cook go to market seven miles away on his bicycle once a week, instead of daily.

She had to put the refrigerator in her living room, for so

WCL: many hundreds of Africans came to see and taste their first ice, that it was unhealthy to have them swarming through the kitchen. By use of evaporated milk, the entire station had ice cream twice daily, and fresh salads, which had never been possible before. This was a great help to Mrs. Prior in feeding the many guests who came to see this new Agricultural Training Center.

Other Missions

Chall: You apparently spent most of your time out in the field and little time with officials in the cities, which gave you a closer understanding of rural problems.

WCL: Yes, I remember so well going to what had once been a very large mission station in Nyasaland. The station had extensive buildings and schools, but no agricultural missionaries. Gradually the soils on these fine sloping lands eroded away. The people had no way of making a living with their productive soils gone, the missionaries had been transferred elsewhere, and the station and entire farming community had been abandoned. All this had occurred in a span of only fifty years.

The British official of the area had no place for us to spend the night and so he put us in the old guest room of this abandoned mission, for which he had the key. He gave us an early supper in his home, for he said we must be settled and locked in before dark and remain inside, for the day before he had killed a lion on the premises and there were many lions roaming about.

There were noisy rats and bats in the thatch overhead, and we sweltered in the heat of the closed windows, but were thankful for them, for soon a lion was roaring just outside, in search of food.

Chall: What did you see going on in other missions?

WCL: Some had a splendid record: the Methodist work in Southern Rhodesia, especially at Old Umtali and at Chichore, and the outstanding work of Emory Alvord, the Mormon missionary whom the British Rhodesian government employed on a lifetime job as Director of Native Agriculture, for the Province of Southern Rhodesia. I'm sorry there is not time for more details, but his life and work has been written up.

I should also like to mention our stay with a Canadian missionary in Nyasaland who had killed more than seven thousand baboons and monkeys during his twenty-three years of work in one locality. It was not always a question of how much land the

WCL: native could cultivate, but how much he could protect from the baboons which compete with natives for the food supply, and were increasing even more rapidly than the natives, since their natural enemy, the leopards, were being eliminated.

Only the white man had the organizing ability and weapons to put on drives to prevent these baboons from starving out local populations. We were told about many fascinating experiences with these clever baboon competitors for food with local people.

Stranded in a Swamp

WCL: Another vivid memory was of a night spent in the midst of the largest swamp in Northern Rhodesia, when our car broke down and we were stranded, alone, while our driver, in the darkness of the forest, walked sixteen miles for help to get us out and on to the important final report to government officials the next morning in Lusaka, the capital city.

All night we were alert, listening to the various sounds of wild animals investigating our car in the darkness: hippos, lions, leopards, elephants, crocodiles--all were possibilities. We were not rescued until about daylight the next morning.

We often had to sleep in so-called "rest houses" without glass windows in the openings for air, which exposed us to large and small insects and animals, but we were able to adjust and find all experiences interesting, at least in retrospect.

Africa's Future

Chall: It has now been eighteen years since you completed this study of British colonial areas south of the Sahara. Do you know what the present situation is in these African lands?

WCL: Well, I have tried to keep informed by those who have been there. All the colonies and protectorates have now become independent and have the self-government they had been clamoring for. But the African has not found it has brought about the utopia that he had imagined.

They have their political independence without their

WCL: economic independence. They have politicians running their countries, but without the technically trained men to do the many things required in a growing society. These politicians have had little or no experience in how to run a country and develop an economy.

The Europeans who formerly ran these countries have been largely replaced by local nationals. They lack the experience to deal with the government machinery that might make best uses of gifts and technical help from "have" nations.

Everywhere I had urged officials and missionaries to put in pilot projects or demonstration areas on a large enough scale to show the possibilities of production and modern methods, but from what I hear, this is not being done; neither has education for African children been established to integrate the child into his environment in a manner I described. Apparently, from whatever source I was able to get information, the Chiefs and witch doctors still hold sway over most farming operations.

But Africa has enormous potentials, and in time, with "blood, sweat and tears," the African south of the Sahara will come into his own, just as our western progress developed slowly with many successes and failures until we have more of the good things of life than any other nation that has ever existed.

But the African cannot leap over the centuries in one great hurdle; he must learn to do things by himself and for himself and not expect the "have" nations to give it all to him without responsibility on his part.

All technical aides--whether from F.A.O., or U.S. Point Four, or United Nations--all say that Israel is the only nation that has known how to use economic aid to advantage. This is in part because many Israelis come from Europe and the United States and have the drive for hard work and accomplishment that the African as yet does not have. We should recognize, our children have absorbed much just by growing up in a modern society with many divisions of labor. This the African child has not had.

The "have" nations, both in East and West, have given a total of about eight billion dollars a year in aid to these Afro-Asian emerging nations. But many do not have the administrative structure to really use foreign aid--no banking organizations, no qualified government officials to make the necessary plans, and a sad lack of technicians to carry out projects to wisely use foreign aid. Then too, foreign aid has not always been wise, such as building plants that have not really benefited the country, except as status symbols.

Then too, all these new nations are so much in debt already,

WCL: they each year must give twenty to forty percent of all their export earnings to pay their debts and each year it gets worse. Indonesia, Egypt and Ghana have already stopped paying their debts, because they are unable to. It is predicted by these other new nations themselves that within the next few years, they will be no longer in a position to pay their debts.

All these Afro-Asian countries are faced with population explosions and increasing food shortages, without corresponding programs to meet the coming crisis.

Chall: The present situation seems worse than when you made your study eighteen years ago.

WCL: Yes, it is, for then "have" nations took the responsibility to feed the people and run the country. These countries now are all in a period of transition. They must have peaceful coexistence among themselves; and the East and West must stop the cold war which eats up vast sums in armaments, and devote efforts toward solving some of the problems of new nations who cannot solve their problems alone.

There is one hopeful thing I see going on in education. Each year there is geometric progress in education. Six years ago, in the Congo, there was only a handful of University students. Now eight thousand a year graduate from secondary schools and enter Universities. These increasing numbers of college-trained men all over Africa are going to become a tremendous force for change and for modernization.

These nations, it is hoped, will not try to industrialize to compete with Europe and America--Africa has much to contribute in other ways that will give them more of the good things of life. But things may get very much worse before they get better and they will need much help.

There can be said no final word about Africa. This vast, immense Africa, south of the Sahara, with its fantastic potential for development and progress is caught up in a tremendous vortex of change that has resulted at present in great confusion. There are so few leaders, as yet, capable to give direction or know what direction to take. The Africans are learning the hard way the responsibilities of independence.

The people who had great hopes for their nations have been sadly disillusioned for the time being. But a new day is slowly dawning for the great continent of Africa and its people, we hope.

CONSULTANT TO BRITISH AFRICAN COLONIES, 1949-1950

[Taped questions and answers]

John Reisner

Chall: Today I would like to ask some more questions about your year of studies in British colonial areas of Africa. I remember your telling of John Reisner who was Dean of the Department of Agriculture and Forestry when you were in Nanking, China. Is he the same man who engaged you to go to Africa on this survey?

WCL: Yes, he is the same man. You see, we were both driven out of China with the first wave of Communists in 1927, as I described to you in my report. John Reisner was an agronomist and his experiences as a missionary led him to some very definite conclusions. He felt that missions everywhere were failing to lay emphasis on growing more food and on better care of farm lands.

He felt medical missions were putting the cart before the horse by healing diseases to continue life without providing food to keep people alive. He felt that missionaries should feed the body as well as save the soul. John Reisner was one of the first agricultural missionaries to devote his life to this type of work.

Chall: What did Reisner do when he returned to the United States?

WCL: We knew we could not return to China and we must all find new jobs or create them. He interested friends to finance Agricultural Missions Incorporated, as a private foundation which he set up in New York to interest trained agricultural men to go out to the various mission fields.

Ten years later, when he found I had retired, he wanted me to make this survey of Africa, south of the Sahara. He approached Carnegie Corporation to put up the funds for my survey, with my wife to go along as my secretary. Reisner also arranged with the British Colonial Office to sponsor my study. In this way, I was to meet with British government officials, missionaries and local leaders and all classes of people, students, preachers, chiefs, and farmers everywhere.

The purpose was to awaken the greatest number possible to the dangers of decreasing productivity of land in the face of increasing populations. I made my final report to the three

WCL: sponsors--Agricultural Missions, Inc., The Carnegie Corporation and the British Colonial Office.

John Reisner wanted me to continue with him and make the same type of survey in India. But just at this time, Morris L. Cooke urged me to return to Washington and head up the Basic Data Section on Truman's Water Policy Commission, and I felt this duty to my own country came first. Reisner was very disappointed and I was sorry to disappoint him, because we had done so much work together.

How Dr. Lowdermilk Wins a Farmer's Confidence

Chall: At different times, you have said that civilization is running a race with famine and the outcome is very much in doubt--not because of a lack of resources, but because of the slowness of farmers in taking on modern ways. What is your method of dealing with farmers who don't understand these modern techniques?

WCL: When I go out into the field in any country, I always try to identify myself with the farmer. I ask to do what he is doing, and because I am awkward, the farmer can laugh at me and it puts him in a better position.

For instance, in Yugoslavia, I tried to winnow the grain. It looked very simple. I took the farmer's fork, but unfortunately, I did not throw it correctly and almost everything came down on my head, to everyone's amusement. In Sinai, I squatted down and took the small, short-handled sickle from the hand of the Bedouin and for some minutes cut his grain.

I find that always at first, these farmers resent the intrusion and refuse to answer questions of the interpreter. But when a farmer sees I am in earnest about him and his work and when I tell him how important he is in society by growing food for himself and others, somehow the wall between us falls down and the gulf is bridged.

In Africa, I had a missionary take me to talk to a bush farmer in his shifting cultivation plot of ground. I had him begin to ask the African farmer questions. He was very much annoyed and said, "Don't bother me. I'm busy." He had already burned the bush and with his little short-handled hoe, he was turning over the ashes and covering up the grains of what they call upland rice.

WCL: I smiled at him and reached over and took his hoe and copied what he had been doing. He laughed at me because, of course, I was awkward with his crude little hoe. I worked for some time and when I returned his hoe, we all sat down to talk on the hillside. We discussed about how important farmers are, for they grow the food that keeps us alive and unless the farmer is prosperous, no one is prosperous. This seemed to him a new idea.

It is this relationship that is so important. One must get the confidence of the farmer by identifying one's self with him and his work.

Another of the many instances was in Lebanon. The farmer with his little cow and wooden plow was plowing across a steep hillside that also had many rocks. I wanted to see just how hard this farmer had to work to grow a little food. We stopped the car and I went to him. At first he was not interested but then he let me take the plow and try to guide the animal and plow among the rocks.

Almost immediately, I lost my balance and rolled down the hillside to the hilarious laughter of my family and the hill farmer. Then, the farmer felt superior and was proud and happy to show me how he turned or lifted the plow to avoid the rocks. So, around the world, I love to be with farmers as they toil to grow food and I identify myself with them.

Groundnut Fiasco in Tanganyika

Chall: In your written questions and answers, you mentioned a brief study in Tanganyika. What did you do there?

WCL: As you know, Tanganyika had been one of the German colonial areas and after the first World War, England took it over as a protectorate for the League of Nations. England had wanted to demonstrate that she could make her protectorate successful.

Now my friend, Dr. John Phillips, who was on the Imperial Food Production Administrative Board, had been authorized to liquidate this ill-fated peanut project and wanted to consult with me for suggestions.

Chall: Why did this project fail so totally?

WCL: Apparently, the entire project was wrongly handled from the

WCL: first. The military were in charge. Of the two thousand employees, they only had four or five agriculturalists.

No land classification was made nor basic data gathered in the choice of area. It had been chosen merely by flying a small plane over it. They had no soil surveys and did not know that only when this sandy soil was wet could it be worked; when it was dry, it set like concrete.

Furthermore, this is very abrasive soil. They had had to use thirty-six-inch plows, drawn by powerful tractors. In one hundred hours of use, this abrasive soil wore six inches off the disc.

They had a most difficult time clearing the land of brush which had heavy root systems. They had to use two giant tractors, with an anchor chain attached to each. As they moved forward, the chain pulled out the brush if the soil was damp. But if dry, the anchor chain snapped off the tops and left the roots intact. Removal of roots then was very costly.

Chall: Then this was almost uninhabited land?

WCL: Yes, but after the military arrived with all their workers and equipment, it was like a little city. Their installation consisted of houses for people and sheds for equipment and tools, including blacksmith shops.

It would now be expensive to move all these away for there was no other nearby project on which they could be used. Yet the British hated to have them remain and rust away, and wanted to salvage something if possible.

I suggested that since they had invested so much here that they should continue it as a research area to build up information which is badly needed for all parts of eastern Africa especially.

Chall: Did they ever grow peanuts?

WCL: Yes, but it was not economically successful for this climate, rainfall and soil. I told Dr. Phillips that I had suggested to British officials in Nigeria, that if they would give the farmers around Kano in the northern provinces a couple of cents more a pound, they would be able to produce all and more that England could eat and use for oil.

Of course, they would have to improve the inefficient railway transportation which I told you about. But that would be simple and cheap in comparison to this exceedingly expensive and disappointing venture.

Critique of British Colonial Policy

Chall: You have seen British colonial areas in Africa, the Middle East and Cyprus. The British, from what you have described, are wise in the way they handle their lands and people in England, but it seems they had a separate policy for their colonies. How do you account for this?

WCL: The two policies were very different, both in rulers and the ruled. In England, there is the law of primogeniture wherein the oldest son inherits the family estate and all is maintained in excellent condition from generation to generation.

But of course, these gentry and titled families have more than one son and they must be taken care of; otherwise, they are apt to feel left out and frustrated. Positions of prestige had to be found for them, so they were sent out as high administrators in the colonies.

They may have been poorly trained, or unsympathetic to the people they governed, and were sometimes arrogant. It would be too difficult to handle all local problems, so from the first the British chose to deal with the elite of the country: in India, they dealt with the rich Princes; in Egypt, with the rich Pashas; in the Middle East, with the rich Effendi; and in Africa, with the Chiefs of tribes. The British held them responsible for law and order as laid down by the British, but left them in their centuries-old practices of exploitation of the masses, who were held back in the status quo.

Also, the colonies were considered solely for profit to the mother country. All processing was required to be done in England to give employment to English workers. In East Africa, sugar could only be refined locally to a certain stage, and then had to be sent to England.

I found the Africans who grew the cocoa did not even know its taste, for all beans were sent to England for cracking and processing. This left the residue that should have gone onto African fields for fertilizer being used on English fields instead.

You remember, England would not let us have cotton mills or spinning machines, and the American colonists only got them by some smart fellow memorizing all the mechanical details and then making drawings after arriving in America.

The British policy was to allow the African to have the use of his lands for growing food. He also was given employment in mines and other works of exploitation of natural resources at the

WCL: rate of one and a half shillings a day, regardless of how the prices of food were rising. But the British claimed for the Crown all minerals of all kinds above and below ground, including diamonds, mahogany and fine hardwoods as well as ivory from elephant tusks.

This was the easy policy for England, both for rulers and for the ruled. But then came this new era of the common man and the rising tide of his desires for more of the good things of life that he saw others having. His white rulers lived in mansions off native resources. The gap between them and the masses was so great that the British did not realize quickly enough that they must meet this oncoming tidal wave of nationalism and the rising masses for a better way of life, or else lose their colonies.

I repeatedly said, even to British officials, that it would be much better for England, as well as the colonies, to make the colonial peoples prosperous so they could buy from England and have a tax base on which investments could be made, rather than just using the colonies for the benefit of England.

Of course, the British realized this too late, and even though in some places, the British tried very hard to reform their policies, the African was so full of suspicion of government policy, he refused to cooperate, even in his own best interests.

Chall: So you feel that these are some of the reasons for the fall of the British colonial empire?

WCL: Yes. Of course, there were other local reasons in each area, such as in Africa where the agricultural officers were returned to England on furlough every eighteen months and in order to get a raise must be transferred to another area. But over-all British policies seem to have been about the same in all colonies.

When we were house guests at the mansion of the governor of Northern Rhodesia, my wife was outspoken about British policy there, and said to the governor, "What the British are doing here is to endow backwardness and to stabilize stagnation."

Then too, throughout British colonies in Africa, I already described in detail how education had failed the African and trained for white collar jobs, instead of useful work with the hands to grow food and make things required in a growing economy. The white man did no labor; therefore, the goal of the black man was to get a little education as a clerk and do no manual work at all.

Southern Rhodesia

Chall: You once mentioned that if you were young, you would like to go to Southern Rhodesia and give your energies to develop that country. Why did you feel this way?

WCL: Because if ever there was a white man's land, Southern Rhodesia is it. The climate is wonderful, rains come in summer and winters are delightful. The altitude is four to six thousand feet. There is an abundance of water, both for irrigation and for hydropower, and for domestic purposes for any foreseeable future developments. The soils are excellent.

Probably at one time, Southern Rhodesia was forested as we saw in the St. Selinda remnant of natural forest, but elsewhere forests have been destroyed by the annual burning of Africa that has gone on for centuries. But planted forests are amazing in their annual growth. I saw eucalyptus trees that were almost equal in height to some of our California redwoods, that had been planted only about twenty years. These trees had grown ten feet a year.

Along with this favorable climate, abundant waters, hydropower and excellent soils, there is besides other minerals, a mountain range of very high grade iron ore that is sufficient to last during centuries of exploitation.

Then too, I felt a certain emotional fondness for Southern Rhodesia because it was here that Cecil Rhodes made his money that set up the Rhodes Scholarships by which I benefited by three years of study at Oxford University, England.

Chall: Did Cecil Rhodes live and die there in Southern Rhodesia?

WCL: Yes, and one sees his policies everywhere in the big mission stations. He gave very large tracts of land to any missionary organizations that would come and establish themselves in Rhodesia. He felt that they were an excellent civilizing influence in the sparsely settled country with primitive people.

Of course, I went to his tomb, chosen by him in a strikingly picturesque setting among the giant granite kopjes. These kopjes were small mountains millions of years ago that have weathered by wind and water erosion until now many are about one hundred feet or less in height.

They look like balls or great gray bubbles on the landscape. Cecil Rhodes' grave is on top of one of these giant boulders; just a simple engraved flat slab denotes his burial place.

WCL: I believe I have never told you that it was here among the kopjes that I was taken to a cave which had not yet been visited by explorers, and took pictures of prehistoric cave paintings on the walls that were remarkably clear and well preserved.

Lowdermilk Turns Down Offer to Live in Southern Rhodesia

Chall: Where was this cave located?

WCL: I should have told you that this cave was on the private land of an American, J. K. Kapnek, who went to South Africa and Rhodesia in the early days and became a millionaire many times over. He was especially proud of this twelve thousand acre farm called Frogmore, in Southern Rhodesia. On rich lands between the kopjes, James Kapnek grew fruits, citrus, vegetables, tobacco, fields of grain and the like, far beyond what could be disposed of.

I told him how he could raise the height of his dam by ten feet and double the volume of his stored irrigation water, and yet have a safe spillway in case of flood. I suggested that he prepare a channel to dump excess water into a side canyon that was just in the right location to do this. He took my suggestion.

He was very anxious to have me come and live on this farm and be on the board of directors. He promised to give me a deed to considerable land and water rights, to build us a house according to our plans, and also to make me wealthy by putting me on the board of directors of the largest flour mill in Africa and also make me a director on many others of his projects.

Chall: That sounds like an enticing proposition. Why didn't you take it?

WCL: We did think it over very carefully. Kapnek's one stipulation was that I must live at Frogmore nine months of every year and go to the States for vacations but not to take other work. My wife says that I have always been the "don't fence me in" type. I felt I had other challenging places to go and work to do and I did not like the idea of being confined here for the remainder of my life.

So we turned down the chance to be rich but gained far more than money can bring by being free to work on President Truman's Water Policy Commission, to work under General MacArthur in Japan, to work a year at United Nations headquarters in New York, and to have six wonderful years in Israel.

Ants in Africa

Chall: That is certainly the story of an interesting challenge. Dr. Lowdermilk, you told of astonishing plane passengers by telling the type of soil in various landscapes as you flew over them, because you could see the color of the large ant hills in Africa. Are these ant hills all over Africa, or just in certain places?

WCL: The ant hills are all over Africa, from Capetown to where they dwindle out in the Sudan, probably because of lack of moisture.

I found ants of Africa vary with locality and food preference. Some are carniverous, as the ferocious driver ants. Others feed upon nectar and honey dew. Some are harvester ants and gather and store seeds and hay, while others live on fungi which the ants cultivate in underground gardens within the ant city.

The ants of Africa are sometimes called the earthworms of the land. However, they do not confine themselves to the task of stirring up and enriching the land as do our garden earthworms.

Rather, they invade homes for food, undermine floors and rafters, dig out tunnels in doors and window frames and may honeycomb tamped earth walls of houses to make themselves an ant city, protected by the plaster and roof of homes. Only the driver or soldier ants are harmful to human and animal life.

Regardless of their type, species, social habits and food preference, the ants of Africa were to me a fascinating sidelight on my studies in Africa.

Chall: Which ones in particular interested you?

WCL: For instance, in Southern and Northern Rhodesia and particularly in Nyasaland, we saw ant mounds much larger than native houses, up to sixty feet across, or elongated, and up to twelve feet in height. Some fields had so many of these mounds there was little room between them for farming. But I noticed that they were never too close together, but allowed food-gathering spaces between for each mound.

Our host in Lusaka, the capital of what is now called Zombia, wished to remove one of these ant hills from his front yard. He had to remove six hundred tons of earth. This meant that the tireless ants had excavated, a grain at a time, 5,400 cubic feet of earth from below the surface.

A missionary turned his hose running full force into an ant

WCL: hill in his yard. It ran for many days and nights and still had not filled in all the underground areas so the missionary decided not to further waste his water. I suggested that this would be a good way to store flood waters in underground aquifers rather than allowing it to flow off the area.

These African ants do an enormous amount of architectural construction to build their ant cities. Their structures differ in size and form according to time-honored instincts of various species.

However, all ants seem similar in their highly organized social instincts. They live and work for the preservation and good of the group. Individual ants are completely subordinate to the central will. Their accomplishments and ceaseless industry are not hampered by labor unions, short work hours and fringe benefits. They work from daylight to dark.

In tropical West Africa, we were fascinated by enormous white ant skyscrapers. Generally these were from five to seventeen feet tall. They resembled miniature cathedrals, with tall sharp pointed towers of various heights rising from the top and fluted side walls.

The exterior walls of these tiny, white ant, "high rise" structures is well cemented over with a special ant saliva-mix, manufactured on the spot as each grain of earth is put into its place. These walls do not erode even in heavy tropical rains of from one to two hundred inches annually.

We compared these highest ant structures with the highest man-made structure, the Empire State building. We estimated that one of these ant hills fifteen feet high, when compared to the size of the ant, is more than six times as high as man is to his highest structure.

But the ants far out-build man in speed and efficiency. White ants build their mammoth structures in a year or two, carrying one grain of earth from below ground, along with the necessary saliva-cement mix to seal on each grain as they place it in its proper position in the structure.

But man, in his big construction works, required huge concrete mixers, elevators, derricks and various machinery and requires treble or more time. We are told that it required two hundred thousand men, twenty years to build the largest pyramids of Egypt. No wonder the ancient proverb says, "Go to the ant, thou sluggard, and consider her ways and be wise."

I have told you of the huge mounds and the cathedral ant construction, but I want to mention another type or two. We were

WCL: especially interested in the air-conditioning worked out by ant construction in certain areas of Swaziland and Southern Rhodesia.

Some lands were dotted with what seemed like thousands of chimney-like structures of all sizes up to four feet in height, with an umbrella-like cover over the ventilating columns which keep out sun and rain. These are built up in a comparatively short time by myriads of hurrying, industrious little ants, carrying up a grain of earth at a time. They are placed at rather close intervals to ventilate and cool all portions of the ant city below the surface.

I believe it was the French philosopher, Henri Bergson, who maintained that insects have developed instinct to a higher degree than humans have developed intelligence.

I will take time to tell you of just one more ant that especially interested me. These are the harvester ants in many parts of South Africa. They climb a stalk of grass or grain and first remove all the seeds and carry them to the underground ant city. Then they begin at the top and cut off each stem all the way down in pieces of about one and a quarter inches long, and carry these pieces underground to their special storehouses.

Over large areas, the ground has been bared many feet from each ant hill resembling boulders. These thousands of ant cities, with their millions of ants, require tons and tons of grass. They devour much of the good grasses needed by herds to supply the needs of human populations who so often eke out a meager existence in the denuded countryside. When droughts occur or grass is scanty, the ants make quick work of harvesting and leave fields totally denuded.

My wife has many fascinating stories told her by people who had experiences with the ferocious driver ants, but I think we have spent enough time on African ants as it is.

Other Experiences in Africa

Chall: Well, that year in Africa south of the Sahara was certainly a time of fascinating experiences.

WCL: Yes, even in starting home we had two unforgettable experiences. We took time off to make a quick trip to Victoria Falls which has quite a long story connected with it and our being stuck in

WCL: the middle of a swamp overnight. But the sight of that river tumbling into the deep gorge formed by the Zambezi River is one of the wonders of the earth.

The other experience has been shared by few others. We were flying from Nairobi via Israel to return to the United States. The pilot's mother was sitting with my wife and she remarked that if Mount Kilimanjaro was not hidden in clouds as is the usual thing (for it is the highest mountain in Africa), her son was going to fly over it so that she could see it. She left soon afterwards and went to the cockpit.

Sometime after she left, my wife who had been looking across saw a mountain some distance away and wondered if it was Kilimanjaro. She put her face against the window pane to look straight down to see if there were herds of animals. Suddenly she frantically yelled at me across the aisle, "We're on top of Kilimanjaro. Quick--take some pictures!" I looked down for a split second, grabbed my camera, and without taking time to focus, snapped two pictures and then to my horror, ran out of film.

But fortunately, both pictures were excellent. One picture looks down onto the top of twenty thousand foot Kilimanjaro and into the most perfect crater one could imagine. This small crater was inside the huge crater that covered the top of the mountain. The next picture showed the large crater again, but also the columns of ice, looking like a white forest built up by the centuries of extremely cold winds.

Then the pilot circled the mountain only a few feet from the black craggy steep sides, taking us in an entire circle of the huge cone, then flew us again over the top. It was a gloriously clear sunny day and the view of this giant mountain, as we looked down at it, was a lifetime experience. I never ceased to grieve that my camera was not full of film, for I have never seen such views of Kilimanjaro as we saw that day. Africa thus gave us a wonderful send-off.

XII WATER RESOURCES POLICY COMMISSION, 1950

[Written questions and answers]

Chall: After this strenuous year in Africa, south of the Sahara, without vacation except for those two weekends, I presume you planned a real rest and vacation?

WCL: Yes. We looked forward longingly to it and dreamed of the leisurely trip across from New York to Berkeley, California, in a new car, enjoying the beauties of our wonderful country and also having time to digest the experiences of the year of African studies before writing the final report. So the next day after arrival in New York, we bought a car and made preparations for the cross-country trip, but as the old saying goes, "The best laid plans of mice and men are sure to come to some bad end," and ours certainly came to a sudden end.

Lowdermilk Requested to Serve on the Commission

WCL: Morris L. Cooke finally located me through plane arrivals with a telegram requesting me to come to Washington, D.C., at once. He wished me to be chairman of the Subcommittee on Basic Data, on President Truman's National Water Policy Commission, a very big undertaking. Morris L. Cooke was the chairman of all the various working committees of the Commission. He said they had held this position open for me for two weeks and hoped I would come to Washington immediately.

This was indeed a blow, especially to my wife, but as usual she rose to the occasion and said she would find someone to drive out to California with her and permit me to leave her at once for Washington.

As usual, I went directly to the Cosmos Club, which had been my home on so many other occasions when in Washington, and I began work the following morning, on January 20, 1950.

Chall: You must have been disappointed to start work without taking a much-needed vacation.

WCL: Yes, I was; but on the other hand, this was a great change, and

WCL: a great challenge, and an important undertaking for my own country. Furthermore, I would be working with national and international experts in fields in which I had been especially interested for many years. It would be something which would help me forget all the problems and obstructions of getting things done in Africa. So I entered into this new project with high spirits, to help find solutions to important problems in my own country.

This exhaustive report, "A National Water Policy for the American People," required almost a year to write and was handed to President Truman in December, 1950. Volume I contains 445 pages, Volume II, about eight hundred pages, and Volume III, on legal matters, is not as long.

Since this voluminous report is available to anyone, I need not take time here to go into detail, except to tell in a general way why, at this time, there was need for this kind of a special study.

Organization of the Commission

Chall: How did you select the specialists for your Committee on Basic Data, and who were some of these men?

WCL: Morris L. Cooke and I selected outstanding authorities in their fields, known both nationally and internationally, and I was also given authority to call on many experts who had information or abilities needed to fill out the report surveys. This, on occasion, I did.

My committee consisted of Merrill Bernard of the U.S. Weather Bureau; Carl B. Brown, Soil Conservation Service; Morgan D. Dubrow, Bureau of Reclamation; Albert S. Fry, Tennessee Valley Authority; Gail A. Hathaway, Corps of Engineers; W. G. Hoyt, office of the Secretary of the Interior; Carl F. Izzard, U.S. Bureau of Public Roads; William Liddell, Federal Power Commission; Edward N. Munns, U.S. Forest Service; Louis F. Warrick, U.S. Public Health Service; and Adrian H. Williams of the U.S. Geological Survey.

Morris L. Cooke and his chairmen of the various committees decided on a survey of "Ten Rivers in America's Future": the Alabama-Coosa, the Central Valley of California, the Colorado, the Columbia, the Connecticut, and the Missouri, Ohio, Potomac,

WCL: Rio Grande and Tennessee River Basins.

Each of these ten river basins was studied as a whole in terms of its problems and potentialities, and as pilot projects for river basins of the entire United States.

All the ten rivers chosen for special study, with their problems and potentialities, are written up in the three volumes of our report and are available in all research libraries.

My committee on basic data was one of the first to complete its assignment and I submitted our report to Morris L. Cooke on the adequacy of basic data. He then appointed me to complete standard type reports on the Ohio, Rio Grande and Alabama-Coosa, which other river basin committee members could not complete on schedule.

Reason for the Study

Chall: Had there ever been a survey made, such as this envisioned by President Truman, and why was it made at this time?

WCL: No, there had been many specific small studies made, but no over-all survey. A brief look into the background showed that now, in the middle of the twentieth century, it was imperative that new steps be taken in conservation of our water supplies if we were to continue to progress as a country.

We who are fortunate enough to call ourselves Americans inherited a pristine country, richly endowed with natural resources, fertile land, extensive and varied forests, and an abundance of mineral wealth beneath the soil. All these things are gifts of nature which our people have used to build a civilization unmatched in human history for its material productivity. From the products of our lands, forests, mines and oil fields, we have raised great cities and spanned a continent with railroads, automobile highways and airlines. But without our key resource, water, none of these miracles of human achievement would have been possible.

Chall: Water has always been one of your deep concerns, hasn't it?

WCL: Yes. Throughout history, water has dominated human life. Until recent times, man has not attempted to control water, except in limited measure for water supply and irrigation. But in a brief

WCL: span of less than two centuries, American farms and cities have spread over the land from the Atlantic to the Pacific.

Great harbors have been built, navigable streams maintained and improved, large cities have been supplied with adequate quantities of pure domestic water. In the west, deserts have been made to bloom and large and small dams provide for flood control, hydroelectric power, irrigation and recreation. All these things are the achievements of human ingenuity and enterprise--the work of many individual pioneers and scholars, many men of technical skills, and the cooperation of local, state and federal governments.

Chall: This all sounds good, but from what you have been saying, we have also done a lot of damage.

WCL: Yes, on the debit side, man's activities in exploiting nature also have been destructive. We have used water badly, without proper respect for its natural cycle, turning it from a friend to an enemy. We have destroyed forests, leaving barren, denuded mountain sides from which rain water and melting snow pour unchecked; we have overplowed and overgrazed our lands; we have dangerously increased soil erosion, allowing precious topsoil to be carried to the sea, muddying our streams, filling up our reservoirs and increasing the damage from floods.

Then midway in the twentieth century, two facts became increasingly clear. The first was that water is limited in relation to the many and varied needs for its use, which grow in amounts and complexity as population grows and as industry develops. We can no longer be wasteful and careless in our attitude towards our water resources, not only in the west where water is crucial, but in every part of the country. We must manage and conserve water if we are to make the best use of it for further development of the country as a whole.

The second fact was that the management, conservation and use of our water resources is bound up with the management, conservation and use of our land and that both are essential to our expansion as a nation. Floods cannot be controlled by building higher and higher dams, if other things are neglected. Big streams are fed by small streams, and water control inevitably leads us back to the proper conservation of forests, grazing, and agricultural lands where the raindrop falls and strikes the soil.

Civilizations are built on a combination of water, land and people. A well-rounded national water resources policy to meet the needs of all the people was now recognized as imperative.

River Basins to be Considered as a Unit of Development

WCL: In giving us our directions, President Truman emphasized that every stream should be used to its utmost: each river system, from its headwaters in the forest to its mouth on the coast, should be considered as a single unit and be treated as such.

For years, since 1936, in fact, I had emphasized the need for watershed studies and water control before putting in flood control works further down the river. In all our recommendations, I was grateful that our committee used this new concept of an entire river system as a single unit for development purposes.

We envisioned long-range plans for each river basin and an over-all water resources plan for the nation as a whole, in which individual farmers, workers and businessmen, as well as agencies of local, state and federal governments, would play an indispensable part.

Chall: Was this idea accepted as a basis for recommendations?

WCL: Yes. All were in agreement that river basins are the natural subdivisions of our water resources, and the watersheds are the natural units of these river basins. Therefore, our water resources policy dealt with ways and means of deciding how best to preserve and use the resources of watersheds and river basins.

We were also concerned with how people who live in communities can learn to share in the cooperative application of sound policy which is developed for the water resources within the basin. In all our reports, we used this new concept of a river system as a single unit for development purposes.

This integrated multiple-purpose basin approach applied to all our studies to achieve the maximum sustained use of lakes, rivers, and their associated land and ground water resources, to support a continuing high level of prosperity throughout the country.

It was President Truman's Water Policy Commission that formulated and demonstrated the necessity for the integration of the manifold problems that have arisen and continue to arise in water resource developments. As stated in Volume II of our report: "A river basin is an entity; it is composed of all the land that drains to the river. It encompasses farms in the low lands and plains, the pastures on rolling hills and forests of the mountains. It includes all various communities within the basin and industries that support its commerce."

WCL: So we see that a river basin is all-inclusive. It was during this period of studies of special rivers that I wrote "The Raindrop and the River." In other words, taking the hydrologic cycle from the raindrop, where and how it strikes the land, down through the various stages until the raindrop waters again reach the ocean or seas, preparatory to being drawn up again by evaporation and carried by winds back over the land to return as raindrops. This hydrologic cycle was recognized and expressed by an Old Testament scientist in the Book of Ecclesiastes, Chapter 1, verse 7: "All the rivers run into the sea; yet the sea is not full; unto the place from whence the rivers come, thither they return again." This hydrologic cycle was lost sight of through all the centuries and only rediscovered again about a hundred years ago.

I divided my article, "The Raindrop and the River," into sections: River in the Making, Man and the River, The River as a Complete Project, When a Dam is Built, Developing a Flood Plain, and Conclusions.

In the latter, I said that a river is a complex and marvelous and persisting mechanism. It is merciless in its inexorable forces that will claim as victims those who fall into its clutches, as well as the works of man that he unwittingly and ignorantly exposes to the hazards of normal characteristics of river behavior.

A river may be a friend of man if its behavior is understood, but an enemy if not. Management of waters of a river calls for an understanding of its characteristics and behavior as well as of the possibilities. A river challenges and tests the intelligence and ingenuity and technology of our people in making full use of water and land resources of its basin in a spirit of collaboration.

But by making full use of our rivers, I do not mean dumping into them all the sewage of our cities, waste materials from our manufacturing industries, or rain water runoff from old mining operations that leave the land in such condition that sulphuric acids form and water is poisoned. All these produce a foul liquid that kills both fish and water fowl.

Commission Recommendations

Ohio River

WCL: We found that the Ohio River had become such a wasteway of sewage and poisonous runoff that the job to clean it up would be so tremendous and so costly, that we had to look for some other solution. We recommended that since the waters were in such a poisonous and polluted condition, the Ohio itself be considered a wasteway, and no attempt be made to clean up the river water unless this can be justified economically.

Instead of taking water for cities from the main stream and trying to make it usable for domestic purposes, we recommended that dams be built on the tributaries of the Ohio, to impound reservoirs of fresh water, and that these be kept as free of pollution as possible. These waters would then be conducted to cities along the main valley of the Ohio before they reached the main stream and were badly contaminated.

This solution only highlights the difficulties of permitting waters of our inland rivers to become polluted because such pollution is very difficult to get rid of and costly as well.

Another benefit of this suggestion is that these tributary dams would also serve to assist in controlling the annual high floods of the Ohio when rains combine to melt snow pack on the drainage basin. These floods are often extreme and are becoming more disastrous as populations increase and industries extend onto the valley floors.

It is necessary to establish flood plain zoning for all rivers, so as to keep out of the alluvial valley floor, dwellings, industrial buildings, the feeding of livestock, and such activities that, in case of flood, would lead to loss of life and destruction of buildings. The initial cost of flood plain zoning is low, compared to the cost of dikes and flood storage reservoirs and the like.

Flood plains can be used to advantage for certain agricultural crops, for the flooding of the land for short periods does not kill off the crop, and when flood waters recede, the crop grows more quickly because of the added moisture and the silt deposited over the flood plain.

There are cases, especially in old developed regions, where the property values have grown to large amounts, and in the past have been protected by dikes and levees and may justify the

WCL: continuation of such protection.

Rio Grande River

Chall: Did you find the study of the Rio Grande River as interesting to you as the Ohio River?

WCL: Yes, for of course, I am especially concerned with the water problems in our southwestern states, for here water is more valuable than gold for present and future development. This semiarid Rio Grande basin presents many complex problems that require planning in long-range development of water and related land resources.

This basin has a long history in irrigated farming and raising livestock, dating from prehistoric Indian farmers. Then the Spanish came in and then Mexican farmers, and they farmed along with the contemporary Indians of the region.

All surface water supplies have been appropriated and overdraft of ground waters is taking place in some areas. Improper use of land and water resources in these arid regions with their infrequent but intense rain storms, has accelerated the natural erosion rate and led to severe erosion in range and forest lands and to water logging and leaching of irrigated areas. Sedimentation in the main streams has aggravated flood problems and made proper drainage difficult.

A sound economic program for the Rio Grande basin, which would assure the most practicable and complete development of water, land and associated resources, will have to include many elements of an integrated program. It will have to include watershed management, sediment control, irrigation, drainage, development of hydro-power, recreation which includes protection of fish and wildlife, pollution abatement, mosquito control and transportation.

Chall: Has the federal government been doing anything about this?

WCL: Yes. There are numerous federal programs for rehabilitation of the watershed lands and of irrigation facilities and for more efficient use of present water supplies and development of new sources of supply. But population has increased in the Rio Grande basin so rapidly and continues to increase, so there is grave question as to whether the land base, even if fully developed and efficiently used, will be adequate to supply the basic needs of the growing population.

WCL: A high degree of industrialization is not possible or even desirable in this area. Local markets are limited and transportation costs to distant markets would be excessive. There is no large supply of skilled labor. Most important, there is no surplus water now available for industry except by use of ground water which would eventually reduce the water available for irrigation. People are poor and have little capital or resources to do more than they are doing to support themselves.

The inevitable competition for water between irrigation and industrial use indicates that eventually society must decide how much of the Rio Grande's scarce water supplies should be allocated to each use.

A long-range plan for the orderly development and conservation of all resources of this problem river basin to meet its basic needs on a sound and permanent basis, should be developed through participation of all federal, state and local agencies concerned. This is a river basin shared by states and two independent countries--the United States and Mexico--and the water rights for river water must be adjudicated between the several users.

Alabama-Coosa River

Chall: What about your study of the Alabama-Coosa river basin? We do not hear of it very often.

WCL: This basin is one of the smallest of our studies, and while some features are the same for all basins, this area has special features. Whereas the Rio Grande had a scarcity of water in a semiarid region, this Alabama-Coosa region is one of an abundance or over-abundance of rain, and the topography lends itself to dams and reservoirs for hydro-power, and also lends itself to much greater industrialization.

But this basin is part of a much larger region which is characterized by low incomes, low living standards, high tenancy, deteriorated lands, and exploitation of resources. So the primary objective of all federal programs in the region is the solution of these economic and social problems.

Here there should be a comprehensive program, suited to the needs of the area and designed to make the most of its potentialities, and providing adequate economic opportunity for its people living in predominantly rural areas.

Watershed conditions in the Alabama-Coosa basin and in all

WCL: the Piedmont region are unsatisfactory. Erosion is serious and widespread with much surface runoff; flash floods occur with each heavy rain in the upper tributaries and streams are muddy much of the year. Decades of intensive farming of row crops, largely cotton, tobacco and corn, have eroded off the entire topsoil and farmers and sharecroppers are attempting to grow crops on subsoil with the addition of fertilizers.

In the black soil of central Alabama, this entire exceedingly rich and fertile topsoil has been eroded, exposing the white limestone subsoil beneath. There has been much abandonment of farms as a result.

Progress is being made on a shift in land use from the production of row crops to pastures for dairying and livestock, for by proper treatment, with the heavy rainfall, excellent pastures can be developed on the many abandoned farms and on the seventy-five percent of the lands of the region that are seriously eroded.

Chall: You are always advocating wood lots. Would they do well here?

WCL: Yes indeed. The Alabama-Coosa basin and adjoining regions offer great opportunities for expansion of forest production. All pines adapted to this area are fast growing and grow in dense stands that can produce pulp wood in fifteen to thirty years, depending upon soil type and moisture and other factors. These forest resources have been badly depleted by improper cutting and logging methods, fire and grazing.

This river basin has been losing population as farm lands decrease in fertility or are abandoned. But the rapid forest growth of the region provides an expanding base for the lumber and pulp industries, which can easily be tripled in time and the quality greatly improved if the growth capacity of the land is fully realized.

This will provide a better way of life and more income for the local people, besides allowing the eroded, gullied farm fields to be healed over by rejuvenated pastures or forest growth.

There is an abundant supply of water to support a large industrial and domestic expansion. Careful planning will be required to maintain or improve the present abundant water supplies which thus far have been badly polluted by sewage from metropolitan areas and communities along the river. Besides, industrial wastes have been dumped into the river, containing dyes and toxic substances detrimental to subsequent users of the river waters. If this region is to be industrialized because of its abundant water supplies and hydro-power, abatement of pollution is imperative.

WCL: Also, there should be careful river zoning to prevent industrial plants from being built on flood plains near the river and be subject to future destructive floods.

So we see that river basin development is a complex undertaking that looks forward to the future and accepts the challenges of the application of science and technology and of social engineering for the benefit of all the people within the river basin.

Conclusion

WCL: Eighteen years have now passed since our report was given to President Truman. Integrated river basin development is now a national policy and has progressed rapidly in all the manifold aspects. One very rapid development is the increase in recreation areas everywhere across the country, and every river basin has developed, or plans to develop, the maximum number of "wilderness areas."

Waters for fishing and boating, water skiing and swimming, camping and picnicking are now a part of all natural lakes and new man-made lakes backed up by dams creating reservoirs for flood control, hydro-power and other multiple uses.

WATER RESOURCES POLICY COMMISSION, 1950

[Taped questions and answers]

Chall: I'd like to talk to you further about Truman's Water Resources Policy Commission, especially about your leader, Morris L. Cooke. How did you feel about him as a leader and as a man?

Morris L. Cooke

WCL: We felt it was a great advantage to us to have Morris L. Cooke to head up our Commission. As you may know, he had been successful as chairman of many other commissions. He was a leader and a man who could get people to work together. That's one of his great achievements.

He was chairman of the Mississippi Valley Commission and of the Great Plains Commission. In the earlier days he was chairman of the War Industries Board. Then he was chairman of a commission that was sent to Brazil to help them in the development of the program for the river San Francisco, which is in the northeastern portion of Brazil: where the river basin is separated from the Amazon in such a way that it can be treated more or less as distinct. This was a pilot type of project, to try to attack the problem of the mighty Amazon.

Chall: Was he also an idealist?

WCL: Yes, in all his work he was an idealist and a practical man too. He was a consulting engineer in industrial efficiency. Out of this development has come automation.

Morris L. Cooke was also a great humanitarian. His appeal in rural electrification was that he developed this electrical resource, produced by the rivers of this area, to serve farm peoples with electric power distributed in electric lines, to do many things and make life easier for the people.

Especially, Morris L. Cooke publicized the great help electricity would be to farm women, who ordinarily had to carry water from springs uphill to the houses. Whereas, with electricity, a pump and a pipeline would deliver water to the kitchen

WCL: or the wash house.

Also, with electricity every farm home could have a refrigerator, electric lights, an electric iron and of course, electric washing machines. The burden of farm drudgery was thus lifted from the womenfolk especially. The appreciation of these farm peoples was very touching.

So Morris L. Cooke made the rural electrification program a success across the country even though the power interests fought him furiously.

Chall: Is this the reason he termed himself, in his book, the happy warrior? Did he enjoy the battle?

WCL: Oh yes! He was also a strong labor union man and a close friend of Philip Murray.

The private power interests were not interested in serving the low-income areas. But Morris L. Cooke said, "No, we will make it possible for rural peoples to have this electricity." Once farmers and rural peoples found that they could get this cheap power through rural cooperatives, there was a great movement for rural electrification across the country.

Electricity Comes to a Farmhouse

WCL: One story that always amused me came out of Minnesota, from one rural electrification project. Officials were watching the meters to see how rural dwellers were using newly supplied electricity.

One meter was using less than the minimum expected. Visitors called on this farmer and asked him how he liked his electricity. "Oh, it's wonderful. Wonderful." "Well, we notice that you're not using very much."

"Oh, I have all I need," he said. "It's now so convenient when I come in to my house after dark. I turn on the electric light so I can see how to get to my oil lamp and light it." [laughter]

Chall: Is there more to add about your friendship with and feelings about Mr. Cooke?

WCL: We had a very fine friendship and spent some weekends at their summer home at Hopewell Junction, Pennsylvania, and frequently were invited to their spacious apartment in Adams House Hotel near the White House. When Eleanor, his wife, died, Morris L.,

WCL: as I called him, was a lost man. He only lived an unhappy short time after her death.

Washington During the New Deal

WCL: Washington at that time was very interesting because many personalities were given an opportunity to do something worthwhile on a nationwide scale. Life in Washington then was very stimulating, as I have told in detail in various written answers to your questions.

Chall: I guess these were unusual years in Washington that have never been duplicated.

WCL: Yes, and I am glad I was there at that period. I remember Roosevelt's inaugural address, as I paced back and forth in my living room listening to the radio. It was an electrifying talk during the dark days of the depression, which called forth courage, just like in Israel in the six-day war. It was the courage to which people responded, to an appeal that was important and effective.

Chall: Yes, and there was a great deal of momentum that came out of those years in Washington and you were part of it.

WCL: Yes, it was a great time. Besides Morris L. Cooke's rural electrification, we had the T.V.A. in the United States, despite all the fights it generated by private interests that were against it. But it was a thing that one could get a hearing on anywhere in the world at that time. I know people in Australia, New Zealand and other places, who were captivated by the concept of this Tennessee Valley Authority. Of course, at this time, we had a going Soil Conservation Service, too.

Origin of the Water Policy Commission

Chall: What is the origin of President Truman's Water Policy Commission?

WCL: It was really Morris L. Cooke who suggested to President Truman

WCL: that this study be made and President Truman appointed Cooke to work out this national water policy for the American people.

Ordinarily in cases like this, it would have been called the Cooke Water Policy Commission, but he was a modest man and insisted his name be left out and President Truman's name be put on instead.

Concepts of Flood Plain Zoning

Chall: You told me that in the river studies there had been some controversy over the whole idea of flood plain zoning. In Fremont, in southern Alameda County, there is now flood plain zoning. Was this a new concept in 1950?

WCL: The Corps of Engineers were doing much construction of levees and dikes, but had not yet accepted the idea of zoning. But now they specify it as one of their objectives and basic policies. One reason why the Corps of Engineers did not accept the idea of flood plain zoning was because their specialty was to build dikes and dams.

I was on a trip to make a speech in Cincinnati when a flood on the Ohio in Kentucky in 1944 had closed railroad bridges, and I was held up. I listened to the radio walkie-talkie of rescue operations, and then of course there was the awful, tremendous damage done to property.

The Corps of Engineers formerly would say to victims of floods, "This is too bad that you have to be subjected to this sort of thing, when by building dikes we can protect you from these floods."

The Corps of Engineers would promise people that if they would get their congressmen to present a demand for flood control in their river basin, the engineers would protect them from future floods by building levees or dikes for them and when necessary, flood control dams.

In this way, things favored the Corps of Army Engineers. They had an enviable position because they were thought of as life-savers in these various places and were honored and appreciated in public speeches.

Chall: Wasn't it known then that dikes and levees and big dams as such

Chall: wouldn't prevent major floods by themselves?

WCL: Yes, it is a complex problem, but once the area is protected, so-called, it permits more congestion, concentration of more valuable property, and more lives would be endangered. This then would justify, financially, even higher levees. But this does not provide protection against probabilities of a fifty- or one hundred- or a thousand-year flood.

For instance, California, you know, in '64 had what we call the thousand-year flood, and then the next year we had another exceptionally high flood.

The Army Engineers have the authority to go in after floods and do what is necessary, even to buy out and move the people. In some places where the floods were very destructive, rather than build dikes or levees they would move the people out. In fact, we had such a case up in the redwoods. The flood stage was up about twelve feet above the road. The local people wanted the Army Engineers to build a dike to protect them. It was obvious that this was not the solution. The Engineers suggested moving this town out of the flood plain a comparatively short distance up the slope.

Chall: Were they able to achieve this?

WCL: Oh yes. Progress has been made but it takes time to get such things accepted. They oftentimes involve tricky problems that have to be worked out. We are much ahead of where we were years ago.

Basic Data Committee

Chall: In your Basic Data Committee, you had people representing all of the agencies which would be concerned with conservation, recreation, hydrology. Were they in general agreement on the kinds of data that should be collected before asking for appropriations for major projects?

WCL: The operation of this sort of thing always lags behind the ideal. But among technical people and professional scientists, especially in the water field, we say we always want more data and greater facilities for analyzing and interpretating data that are collected. So we had little trouble there.

WCL: Fortunately, this idea of basic data has been a live subject for a long time. It wasn't anything new to the Cooke Commission. One reason why we in basic data were able to finish our report before most of the other sections was because our geological survey and meteorological people and Tennessee Valley Authority were great on developing and accumulating data.

We had an inter-agency committee which occupied itself with gathering information on development of natural resources. So our Basic Data Committee had a head start.

On our Basic Data Committee, we were to determine the minimum essential background information necessary for the sound planning of river basin projects and programs. We were also to determine the principles which would govern the basic information gathering programs of the federal government, to assure as rapidly as possible the required data on a continuing basis and its analysis.

Our objective was to establish standards which will assure that projects and programs will go forward on the basis of adequate data.

We made strong recommendations to Congress for funds to develop and enlarge all areas of gathering basic data, to be available for projects of many kinds. This need for basic data covers such wide areas that it cannot be discussed here but in out voluminous report, the subject of basic data has been dealt with in detail.

To be sure, we used to have a lot of scraps over what was an adequate statement of basic data. But our whole committee was proud of this report and our part in it. We had a good start because much had been done, but we set higher standards and defined and refined our patterns of collection and means of processing the data, so that we were in a position to go forward.

Chall: Then you felt a sense of accomplishment in this work on the Commission?

WCL: Yes indeed. One of our great developments was that this study increased the intensity of thinking about the utilization and conservation of our resources. We spend so much on the military budget but so little in comparison on saving our national resources.

Chall: I guess it's difficult for scientists with a humanitarian point of view, who know how much there is to be done for people, to accept this.

WCL: Yes, it certainly is.

XIII TRAVEL IN JAPAN: TWO VISITS--1926, 1951

[Written questions and answers]

Chall: Dr. Lowdermilk, you have not yet told of your two trips to Japan. Will you tell why and when you went to Japan?

WCL: Memories of my two trips to Japan and the V.I.P. treatment accorded us on both occasions are among the most cherished of my long life. While I was in China on the famine prevention program, the United States Forest Service appointed me to represent them at the Third Pan Pacific Science Congress, scheduled to meet in Tokyo in the fall of 1926. Practically every country bordering the Pacific basin sent representatives of their scientific organizations.

Third Pan Pacific Science Congress

WCL: This Third Pan Pacific Science Congress held in Tokyo was really the "coming-out party" for the Japanese scientists. Prior to this, Japanese scientists, eagerly studying the scientific progress of other countries, had been called "copyists." Now the Japanese invited leading scientists from all countries bordering the Pacific basin to come to Japan and see the progress and original work being done by Japanese scientists, which we found was astonishing and inspiring in many fields.

Each delegate was given V.I.P. treatment, generally accorded only to those of ambassadorial rank. While still on the boat, we received a personal radiogram of "Welcome to Japan." Each delegate was met at whatever port of entry by a special representative of the government and given free passes over all the railways of Japan for a month, with passes for an additional two weeks in Korea, if delegates wished to travel longer.

We were then conducted to our train to Tokyo, with no confusion in baggage or customs. Again on arrival in Tokyo, we were met and a limousine was placed at our disposal at all times. We were given a suite of rooms in the Imperial Hotel overlooking the Emperor's Palace. On our table was a pile of invitations, some twenty or more, inviting us to banquets, garden parties, teas,

WCL: theaters, special two to four day tours, including Nikko, Hokoni, Lake Chugengi, Beppu, Kyoto, and three days motoring, by auto or motor-boat, around the lakes surrounding Mr. Fuji, so that almost continually we would see her white summit as a pearl against the blue sky, which fortunately at that time of the year was not buried in clouds.

Never have we known such efficiency. On all these trips, our baggage was left in our hotel room and was awaiting us in our new quarters on our arrival at the end of the day. The efficient handling of banquets was also astonishing. There was never any noise or clatter--suddenly at a silent signal from somewhere, all service plates were removed in a few seconds so that conversation could continue without interruption.

The richest man in Tokyo entertained us in elegance at a Japanese dinner, with all the gracious etiquette and formality of service, of bowing maidens in constant attendance on our every need as we sat on cushions on the floor in front of our small tables. This cramped position caused one delegate to remark as he tried to stand, "My, I'm glad I'm not a centipede." We were continually entertained by geisha girls at intervals during our elaborate dinner.

Each of the Royal Family entertained us at their palaces, where gardens were beautiful beyond description, and where we strolled about while bands played and lavish refreshments were served in gay tents put up for the occasion.

The then Prince Regent and his Princess entertained us at a chrysanthemum garden party in the grounds of their palace, but we were only allowed to see their divine, God-embodied persons at a distance. They walked through the garden without glancing our way, though every eye was on them.

On my next trip to Japan, twenty-five years later, the war had robbed the Emperor of the divinity accorded him through the centuries by his people. We were both at a tree-planting on Arbor Day. The Emperor evidently enjoyed being a human being now, for he graciously shook hands with me and others, and both he and his wife dug their own holes and planted their own trees along with the rest of us. The Japanese people loved him more in this status than as a divinity.

Chall: Well, I can see how this must have been one of the most interesting months of your life. What about the scientific aspects of the conference?

WCL: There were many outstanding papers presented. All delegates were astonished at the tremendous progress the Japanese had made along most all kinds of scientific research. We were all enlightened

WCL: also on earthquakes, for sections of the city had not yet been rebuilt since 1923, and the tragic loss of life was fresh in everyone's memory. Japan also put on a very good little earthquake demonstration for our Congress which was appreciated less than other forms of entertainment given us.

Lowdermilk Reads Paper on Causes of Soil Erosion in China

Chall: I believe it was here that you gave your first report on your research work on measuring soil erosion on bared ground and on soils with surface litter in China.

WCL: Yes. As far as I know, this was the first paper that had ever been presented to a scientific group, giving scientific measurements of rates of erosion; and it was here that I first used the phrases I coined but now are in common use--that of "geologic norm of erosion" as differing from "accelerated erosion," due to man's removal of the soil mantle and exposing the bared surface to the dash of rain, with resulting washing away of soil.

The response to my paper was most gratifying. Though it came last, at the end of a full day, the room was filled and many were standing. No one left and all remained for questions and answers.

I believe the great interest shown was because here was a new and unique subject of scientific and human interest. Here was a study of a common feature of a landscape that affected the production of food and related to famine as a result of loss of fertility due to erosion.

The geologists were especially interested because we recognized the geologic processes of erosion under undisturbed conditions and how it was accelerated on lands that had been disturbed by man and his agencies. So this related the processes on farm fields to the future welfare and well-being of the nation.

Chall: This made an interesting introduction of your studies on soil erosion into the international community of scientists. Did you attend any other Pan Pacific Congress meetings?

WCL: Yes. I attended the Fifth Pan Pacific Science Congress held in Victoria and Vancouver, Canada, in 1933, and I was elected chairman of the Land Utilization Committee of the Pacific Science Association. In Berkeley, I gave a paper in the 1939 Congress, entitled "The Eleventh Commandment," in which I dealt at length on the part that soil erosion has played in the rise and fall of civilizations.

WCL: On this first trip to Japan I was much impressed with the fine work the Japanese were doing in forestry, and on occasion I did not go on the official sight-seeing trips, but preferred to go out with the Japanese foresters. The Japanese appreciated this and never forgot it, as I discovered on my second trip twenty-five years later.

Consultant on General Douglas MacArthur's Staff

Chall: How did you happen to go to Japan on the second trip immediately following your year's work on President Truman's Water Resources Policy Commission?

WCL: I was sent by our State Department to act as advisor on erosion and flood control during the regime when General Douglas MacArthur was Commander in Chief for the Allied Powers in Japan. I worked under the Economic and Scientific Section of the Natural Resources Division, from January to April, 1951.

Japan had been defeated. Hundreds of thousands of Japanese soldiers and nationals were forced to return from all territories taken over just before and during the war. Their entire economy had been geared to military aggression to give space to their exploding populations, and now the small islands had to feed, house and provide jobs for these returning multitudes.

This put a very heavy burden on Japanese farmers, even though the United States prevented starvation by shipping great quantities of our surplus farm products. We spent 350 million dollars annually on food for them.

The Japanese recognized that the time had come to take a new look at their land and water resources, and at how to safeguard their limited food-growing lands from the increasing floods and soil erosion. We had just completed a similar study in the United States to form a national water policy. Now Japan wished our help to guide them in a similar study.

Chall: How did you feel about leaving your family and going overseas again?

WCL: Well, this was a fascinating challenge, for it was something I could do for my own country and also give the Japanese the benefit of our recent extensive studies in the United States. I was given V.I.P. treatment by the military across the Pacific and

October 12, 1950

Major John E. Keough, GSC
Chief, Personnel Section
Office for Occupied Areas
Office of the Secretary of the Army
Department of the Army
Washington 25, D. C.

Dear Sir:

With reference to your letter of September 14, mailed to 1620 LeRoy Avenue, Berkeley, California, and my reply of September 27, I shall complete my assignment with this Commission on or about December 11. I shall then be ready to undertake soon thereafter the assignment referred to in Colonel Schenck's letter of August 8.

The assignment here with the President's Water Resources Policy Commission is taking more time than I had at first thought it would. We are, of course, dealing with principles and information that are applicable also in Japan to somewhat different degrees.

I am writing Col. Schenck (copy enclosed) to say that it would be possible for me to undertake the assignment to the Natural Resources Section in Japan about January 1, 1951, and to learn if that would fit satisfactorily into his plans.

We have been very busy here. That has prevented my completion of the forms included with your letter. These I shall do by Monday and forward them to your office.

Very truly yours,

W. C. Lowdermilk
Consultant

cc: Col. Schenck
WCL/dep

WCL: again had a beautiful room in the Imperial Hotel and a limousine placed at my disposal, though except when it was raining, I preferred to walk to my office.

I had contact with literally hundreds of staff members of the many agencies with whom contact was made. The contributions of all were outstanding so I could not begin to mention them. But the few who traveled with the party during most of the field studies became real friends and I still continue to correspond with some of them. I just had a letter from Dr. Ito last week; and Dr. Toshio Takenouchi, a hydrologist whom I first met in 1926, has come to visit us periodically during these intervening forty-two years.

Enroute by plane to Japan, it occurred to me that I should have brought along my paper that I had given before the Japanese scientific groups in 1926. Imagine my surprise and pleasure to be met at the plane on my arrival by some of the scientists who had taken me on the forestry field trips twenty-five years before; and to my astonishment, they carried with them my paper, delivered at the Third Pan Pacific Science Congress in Tokyo.

They had had the pictures of my report duplicated and had made copies by hand of my entire paper. I felt very touched. I never could think of the Japanese as my former enemy, for among scientists, there is a bond of friendship that supersedes race, politics or religion. We are all brothers in science in our search for truth. So my introduction to Japan on this second trip was also a very happy occurrence.

Soil and Water Problems in Japan

Chall: What were the main soil and water problems you found in Japan?

WCL: I would say controlling floods and preventing damage on the low-lying food-growing lands by resulting soil erosion. Rugged topography which makes up seventy-five percent of the country and an abundance of rain and snow averaging more than two and a half times the fall on an equal area in the United States, sets the stage for erosion and flood problems.

Furthermore, the Japanese landscape is physiographically young. Only recently in geologic time was the land ridge of Japan lifted up rapidly to great heights with steep slopes into the sea. This ridge, lying athwart the path of monsoon winds,

WCL: receives heavy rain and snowfall and occasional typhoons that sweep down floods in torrents with tremendous cutting power, in what may be called geologic erosion; this brings down enormous amounts of erosional detritis from highlands to lowlands. The vast floods from the typhoon Kathleen, in September, 1947, emphasized the need for the integration of resource development within river basins.

The piecemeal attack of the past was recognized as inadequate to meet the new requirements. Comprehensive planning, integration of projects and operation were required. Rivers of Japan, such as those inspected for this study, were special problems in acute stages.

Watershed management is now a science in development. It calls for an evaluation of all important aspects of condition and use of lands and waters within the drainage basin, and the integration of plans and works to meet enlarging demands made by increasing populations, especially the protection of existing lands under use. The Japanese had accumulated much important basic data, but there was need for much more information and continual re-evaluation, because of the rapid physiographic changes caused by vast quantities of easily erodable volcanic ash spread over the country.

Geologic Erosion

WCL: In Japan, the big task in their crisis in land use was not so much how to reclaim land, as important as that is, but how to safeguard from damage and destruction land already in fields long nurtured in growing food and fibers for the people. Billions of yen had been and are being spent, and many more billions will be spent for torrent control works that do not provide for growing one more koku, or bushel, of rice.

All this vast expense of past, present and future is made to defend lands already under use. With all this expense and effort, engineers say they are scarcely holding their own. They are still losing ground, literally and figuratively, in spite of the great industry of the people and application of modern engineering techniques.

The Japanese spend many times the value of the land in mountains just to protect the lower food-growing lands. When there is a soil slip or break on the slope, they at once take steps to repair it before it enlarges.

Chall: It appears that the Japanese are faced with the double challenge

Chall: of holding back or diminishing the normal geologic erosion taking place in their young country that levels high places and fills in low lands, and controlling the accelerated erosion due to over-cutting of forests and wrong uses of steep lands for growing food.

WCL: Yes. It is a tragic situation for the hard-working, industrious Japanese that the enlarging demands of an increasing population have exceeded the carrying capacity of lands and waters of Japan in growing food. It is doubtful if Japan ever will grow food enough for all its people.

Japan is a picturesque land for this drama in human geography. Climate is reasonably favorable, rainfall abundant, topography is rugged and uplifted, soils are thin on mountain slopes, streams are short with steep gradients in headwaters, and plains are outwash deposits of river valley excavation out of mountains.

These conditions set the stage for rapid geologic erosion as is shown by deep V-shaped valleys being cut into country rock, and by coarse detritis on outwash fans and alluvium in plains and delta fills in bays and estuaries. Geologic erosion is proceeding faster in Japan than took place in older dryer lands elsewhere.

Thus this teeming and industrious population is faced with the special problem that normal geologic processes of erosion are working so fast and changing the landscape so rapidly, that people find it hard to make continuing and necessary adjustments and repairs.

The Japanese people have been forced into a gigantic contest with geologic forces of stream erosion, valley excavation in the form of breaks, landslides, and mud flows quite unlike most parts of the densely populated areas of the world. All this calls for what I call physiographic engineering.

Erosion Control

Chall: What had the Japanese been doing to control erosion?

WCL: The battle lines of this contest first were drawn in upstream valleys that cradle flashy storm floods and rivers of boulders, gravels and sands. On outwash fans and in flood plains, levees or dikes were built to keep flashy flood waters out of maturing rice crops. But rivers of sands were filling these channels higher and higher each year and had constantly to be adjusted and built up.

WCL: Reservoirs were being rapidly filled. Diversions of water for irrigation and hydro-power sufficed for only comparatively short periods of time. Breaks in levees covered older alluvial fields with sands and gravels that had to be brought back into cultivation at high costs or be abandoned. I was told that more land has been lost in this manner than had been gained by drainage and clearing of new lands.

To slow down the geologic norm in a setting where it was abnormally high was to be a major problem of comprehensive watershed management. This gigantic task called for sabo works, for river training, for building of a system of levees, and for diversions for many purposes. All this again is physiographic engineering.

Chall: What other measures could be taken?

WCL: The basic line of attack must be to reduce the cutting and transporting power of torrential floods. This was done by interposing intermediate base levels of stream erosion in upstream channels, supplemented with other methods of preventing surface wash of soil from forested slopes by proper forest management, from sloping fields by suitable soil conservation measures, and from breaks exposing raw surfaces by re-vegetation. These were supplementary to the main attack of sabo dams upstream where floods begin and rivers of gravels and sands are created.

Flood control in flood plains comprises an integrated program of storage in reservoirs, of recharging ground waters of valley aquifers, of diversions, and of passing excess waters through leveed channels, floodways, flood detention basins, and on out to sea.

Fortunately, flood crests are of short duration, seldom more than six hours on the Tone, the river of most critical problems. Flood control is as much a problem in economics as in technology. How much can the country afford? What are the cost-benefit ratios?

Rice Paddies

Chall: I can see what runaway flood waters, loaded with gravel and boulders from mountainsides, would do to the famous rice paddies.

WCL: Yes, the rice paddies must be protected at all costs. The development of rice paddies, with provision for summer irrigation, is one of the astonishing achievements of Japanese agriculture. Developing these paddies in plains and pushing them up valleys and slopes, represents a monumental achievement that makes the pyramids of Egypt mere toys by comparison.

WCL: Japanese farmers have leveled the vast expanse of eight million acres into rice paddies and provided the necessary irrigation canals and furrow and ditches. They demand our highest admiration and commendation.

These rice paddies are an outstanding measure for control of soil erosion and also for use and conservation of water in Japan, for they represent vast reservoirs for use and storage of waters. The water required to grow the rice crop in the ninety-day growing season is about fifty-two inches in depth. About one half this percolates into ground waters and is a renewable water resource.

Also, this large amount of rain waters stored in paddies proves an excellent small, but important, flood control measure, for it takes care of a lot of water and sinks half of it into underground aquifers.

Slopes above paddies, so called dry fields and orchards unless benched by rock walls or grassy banks across slopes, result in the movement of soil downhill. Japanese farmers rake or carry the soil yearly back onto the slopes. But this method of conservation of soil that is founded on manual replacement of eroded soil cannot be considered adequate for an agriculture of the future.

Thus the layout of fields to save soil and the farmers' labor and time must be stressed as necessary in any soil and water conservation phase of watershed management.

Flood Control on the Akui River

Chall: Will you give us an example of your consultant work in Japan on measures of flood control?

WCL: On all field trips, there were Japanese scientists along, generally from ten to twenty, to ask questions and get all the information I was able to give them. One day, we visited the Akui River, which is down-cutting rapidly and had cut away the toe of the vulnerable slope of the Shimobun slide.

Movement started some years ago in rock strata that rested on an impervious layer. Crevasses had opened to depths of twenty feet or more at the top of the slide about one-half mile up. Such crevasses permitted greater accumulations of

WCL: water into the impervious layer which slopes down toward the river. So the slide was self-perpetuating if the stream continued to cut away the toe of the slope. They had tried planting trees, but the movement was deeper than roots of forest trees and carried forest trees along with it.

I had to tell them that the planting of trees and the building of walls in front of the slide, as they were doing, was useless and a waste of time and money. I told them that the most practical treatment of a slide like this in a narrow, steep-walled canyon, is to build a sabo dam across the river about one hundred feet below the slide and around a curve, well out of reach of the enormous pressures created by the slide.

This dam must be built higher than the elevation of the toe of the slide, so that the intervening stream bed will fill with boulders and gravel and the toe of the slide will come to rest against this boulder and gravel fill.

I advised works to be built to prevent the stream from cutting away the toe of the slide again, by the use of rip rap, or large boulders properly spaced, that would direct the current away from the toe of the slope. Also I recommended that the crevasses at the top of the slide should be back-filled and the surface drained to reduce the amount of water that may percolate onto the impervious and sliding strata.

The official in charge commented, "I have been studying this slide for twenty years, and you come here and in a couple of hours tell me more about the slide and what to do about it than I have found out in all these years. I can see that your solution will work."

Probably no country that I know of has more landslides than Japan, and this makes control of torrents and mud flows all the more difficult to control.

Sabo Dams

Chall: You mentioned sabo dams--just what do you mean by this term?

WCL: Sabo is an expressive Japanese term. Sa means sand, and bo means dam. They are check dams in stream channels that also indicate re-vegetation of eroding slopes and supplementary activities. Sabo dams are a special type of engineering that has developed in torrent control more highly in Japan than in any other country I know about. They reduce the potential of erosion above the dam and reduce the cutting and transporting power of torrential floods.

Problems With Mud Flows

Chall: I remember you studied mud flows in the ash of the volcano, Paricutin, in Mexico. Did this experience help you to advise the Japanese with their problems of mud flows?

WCL: Yes, I find that every experience in dealing with natural phenomena enriches one's stored-up knowledge. Japanese topography has much volcanic ash, which is highly erodable. Not enough recognition has been given to mud flows. Too often they are recorded as muddy streams or floods.

But these mud flows deliver a formidable amount of earth material. We went to see one mud flow on the Tone River tributary at the foot of Akagi volcano. This so-called flood, actually a mud flow, had killed eighty-two and injured thirty-four people, destroyed or damaged about four hundred homes and covered almost two thousand acres of rice paddies with debris, and damaged several miles of river improvement work, causing millions of yen in damage, as well as heavy loss of life.

An examination of the small canyon from which the mud flow came showed that this was not the action of flowing water as many thought. Eye witnesses said that this so-called flood moved with the velocity of a man walking.

In Japan, so many valleys have fill or layers of volcanic ash that are the source of many mud flows when saturated. Perhaps by drainage of possible sources of mud flows, many could be prevented.

Japan: Pilot Area in Erosion Control

Chall: In all your studies of other countries, you continually speak of the need for integrated river basin development and for pilot projects or demonstration areas. Did you also emphasize this in Japan?

WCL: Yes indeed. In fact, I said that all of Japan logically might become a pilot area in this highly specialized type of work in torrent and erosion control, which I call physiographic engineering, that must be of interest to the rest of the world.

WCL: As population pressures in other countries require more and more intensive use of land and waters, and correspondingly greater control and use of storm runoff and regulated stream flow, the work of Japan will be of the highest scientific and practical interest. The United Nations should be interested in this work here and give international assistance in scientific studies.

Japan may well become the leader among the nations in sabo or torrent correction works. The economics of such works bypass the values of a free market to those of survival. Measures must be hammered out on the anvil of necessity. Japan may serve as a standard for works in other parts of the world.

Tone River Basin

Chall: Did you suggest that Japan designate particular areas within the country as pilot areas, in addition to having the whole country a pilot area?

WCL: Yes. I designated that the Tone River basin be developed as a pilot area in Japan, for it was of sufficient size and development and contained a wide enough range of possibilities. Conflicts in use of waters and of lands had reached a stage that called for integration.

Many agencies of government at various levels had been at work in this basin but there was now need for an over-all agency, such as our Tennessee Valley Authority, to direct the resource development on an integrated basis.

Few river basins of the world were so densely populated, or the land so intensively used, as that of the Tone River in central Honshu, Japan. Here also the problems of land use and of water control and protection from flashy floods were very important, difficult and critical. Most problems of the entire country in the use, conservation and control of waters and related land uses were represented in the Tone River basin.

It served well as a suitable pilot project to work out, on a practical scale, principles and means of integration of development, improvement, protection and use of varied resources, that could be applied to the country as a whole. I recommended this be done before legislative attempts be made for an over-all policy.

Using Models

Chall: How could you study all these various factors and come up with accurate data for making useful policy?

WCL: In view of the vast expenditures of the past, and those that would be required in the future, for sabo and other torrent control works, I recommended that sabo works of greater effectiveness than the present splendid works be worked out through a new method of using models; for control of stream erosion, production of boulders, sands and sediments in vast quantities must be made a larger part of the flood control program.

This use of models was practically an unexplored field. When I was Chief of Research, for the U.S. Soil Conservation Service, and working on stream behavior in watershed studies, I established a cooperative study in the Cal Tech laboratory at Pasadena, California, whereby models were made of any particular problems. This gave us basic data on stream behavior when loaded with gravels, boulders, sands and debris--in flashy floods and the like--and stream reaction to various works constructed for their control.

Competition for Land

Chall: Was there competition for the scarce lands of Japan?

WCL: Yes. As I found in Israel later, there was competition between industry and agriculture, for industrial plants were usurping some of the best agricultural land around cities. Israel brought about legislation there that no lands could be used for industry if the Soil Conservation Service declared it needful for agriculture. I recommended that this policy would prove useful for Japan.

Competition for food-growing lands had prevented the Japanese from developing grazing lands for pasture because the area required to feed one cow would feed several persons. So the Japanese turned to the sea for their pastures. I was continually fascinated to go to the fish markets where every creature of the sea seemed to be on sale--nothing appeared to be considered inedible. These "sea pastures" provide the meat protein as well as quantities of minerals that give the Japanese people, along with rice, a good diet.

Analysis of the Japanese Farmer

Chall: Will you express your opinion of the Japanese farmer?

WCL: Well, I definitely feel that the Japanese farmer is one of the most industrious and intelligent farmers among the nations of the world. He has developed, under conditions of extreme necessity, methods to make the most of every source to supply his needs and those of his fellow countrymen.

He has been quicker than most farmers to make use of the advances discovered by the scientific studies of the agricultural problems of Japan. The Japanese farmer early took advantage of the discovery of the superiority of hybrid breeding in food and fiber crops. He early used hybrid vigor in growing silk worms to produce the famous silks of Japan. His application of fertilizers is carried out in accordance with recommendations of scientific experimentation in fertilizers.

As with the Chinese, much of the wisdom of the Japanese farmer is based on traditional knowledge. Probably much of this may have come originally from China, even as the Japanese language is basically founded on the original Chinese script, for we find much similarity. Both countries would have committed national suicide centuries ago had they not used human night soil as fertilizer on fields in a laborious and painstaking manner.

These old and tried methods of the past will no longer suffice for the agriculture of the future that must feed double or perhaps treble the present population. Still, if any farmers of the world succeed in making the best use of their lands for maximum production of food stuffs, then I am sure that the Japanese farmer will rank high.

Agriculture in Postwar Japan

Chall: Was postwar Japan different from what it was in 1926 when you were there?

WCL: Yes indeed, for one of the most important events in land tenure in this century had taken place. General Douglas MacArthur had appointed an American agricultural officer, named Wolf Ladejinsky, to engineer a reform in land tenure in Japan. Formerly, farmers

WCL: were forced to pay their taxes in products they grew, and most went to the landlords, who in turn supported the military. The farmers had little for themselves; they were really subsistence farmers.

But during the war such pressures had been brought on the Japanese farmers to grow more food that they banded together to make demands on the landlords and military themselves. So when Ladejinsky made his proposals, the farmers were a strong pressure group to help push them through.

First, a law was passed for the farmer to pay his land rental to the landlords in cash instead of produce. At first inflation was not serious and the landlords received good returns. But as inflation increased, it meant that the farmers paid less and less for rental until it was practically confiscatory for the landlords.

This weakening of the power of landlords weakened the powerful military organization called the Samurai. Finally, the government agreed to buy from the landlords their estates, at a reasonable price, so that they did not lose everything. Then the government rented out the land or sold it to the former tenant on easy terms. This breakup of the powerful landed estates was necessary for the national welfare.

The farmers now became a strong political power and they actively supported the abdication of the Emperor, who had been dominated by the military and the landlords, who in turn had exploited the Japanese farmer. Now the farmers were strong enough to exert power to reverse the entire political situation in Japan.

I was deeply impressed with the Japanese reaction to us as occupying forces in their defeated country. They were polite, courteous and obedient to follow demands made on them. They had been defeated militarily, but they were cooperative and showed a splendid spirit and adjustment to the terrific austerity forced on them by their warlords, aggression and defeat. But they remained a proud and dignified people.

Reports

Chall: Did you write a report on this work in Japan and was it published?

WCL: Yes. I gave a fifty-page report to the Economic and Scientific Section of the Natural Resources Division at the General Headquarters of the Supreme Commander for the Allied Powers. It was published by them in January, 1952.

I also gave a paper on "Problems in Reducing Geological Erosion in Japan," at the International Conference of the Union of Geodessy and Geophysics held in Brussels shortly after my return from Japan, and it was published in the proceedings.

Education

WCL: May I mention one more thing that greatly impressed me on my trips to Japan? It was astonishing how Japan had so rapidly progressed from a nation in which only a few had education and could read and write, to a nation in which every child of school age was in school, not only in the cities but in rural areas. The rate of literacy was higher in Japan, even in 1926, than it was in the United States, and they had continued on this high standard.

Furthermore, they laid great emphasis on education of Japanese school children to instill in them an appreciation for, and a love of, their country, its beautiful scenes and historical places, that gave respect for past achievements. Each year, each class in schools was taken, along with their teachers, to visit shrines, scenic beauties or historical sites, by busses or trains.

Everywhere we traveled, we saw this education of Japanese children in action. There was no litter, no disorderly conduct, no molesting shrubs or flowers. They absorbed an almost worshipful attitude toward their national parks and historical sites that I wish could be emulated by our own youth, here in the United States, at this time of growing juvenile delinquency and disrespect for law and order.

TRAVEL IN JAPAN: TWO VISITS--1926, 1951

[Taped questions and answers]

Chall: Dr. Lowdermilk, you have written so completely about your visits in Japan that I have only a few questions for you now.

Did you see any of the people you had known in 1926, and how did they react to you?

Meeting an Old Friend

WCL: One example I particularly recall. When I was over there in '26, Dr. Sakuri was the director of the forest experiment station, and of course I was interested in research, so we had much in common. He went out on field trips with the other Japanese who were taking us out, so we had an opportunity to see a lot of each other and I got to like him very well.

The next time that I was in Japan, after the war, under MacArthur, they put me in the office of the Natural Resources Section of the Supreme Command. I asked about some of the people that I had worked with before, and I mentioned Dr. Sakuri in particular. They said, "Yes, he's alive." He was living in a certain place. They wanted to know if I'd like to see him. I said I'd be delighted to see him.

A few days elapsed and then I received notice he would come the next day. He was quite old now and was very deferential to me, which I tried to break away from, to be more informal. But what impressed me was that he was dressed formally in long tails and striped trousers. He had everything that protocol demanded, but they were in a pathetic condition, so threadbare.

He was very formal all through the interview, but showed me great respect and I was deeply touched. Conquerors or defeated had nothing to do with scientific friendships.

General Douglas MacArthur

Chall: Did you meet General MacArthur?

WCL: I saw General MacArthur frequently, and arrangements had been made for me to be at a dinner where he was to speak. This was when President Truman called the General to Midway, for a conference with him. But by the time he returned to Japan, I had completed my assignment on the Natural Resources Section of the Allied Supreme Command and had turned in my report, so we both missed the dinner.

Wolf Ladejinsky

Chall: You wrote about Mr. Ladejinsky. Did you meet him while you were in Japan? If so, can you tell me something about him as a person, policy-maker and worker?

WCL: Yes, I met him frequently. We both lived in the Imperial Hotel in Tokyo, and our offices were in the same headquarters building. Ladejinsky became known for his success in bringing about land reform in Japan. He took advantage of the fact that the army and the farmers developed a conflict. The position of the farmers became stronger and stronger as the war advanced.

In my written answers I dwelt more at length on his influence and the remarkable land reforms he stimulated and carried out. General MacArthur supported and approved his leadership and policy of land reform. He was a very powerful figure in Japan when I was there. Of course, the landlords did not like him, but he had great favor with the masses of farmers in Japan, for he had liberated them from centuries of exploitation under the old landlord system.

XIV A YEAR WITH THE UNITED NATIONS, 1954

[Written questions and answers]

Chall: As I understand it, you came back from Israel during the summer of 1953 for a short vacation, intending to return to Israel to begin development of the school of agricultural engineering. You were delayed, however, by an offer to take for a year an interesting assignment with the United Nations in New York. How did you resolve this change in plans?

WCL: We took up the matter with the government of Israel, and they agreed that we need not return until the following year. Then we went out to California to our Berkeley home, to await clearance from Washington to work in the United Nations.

There seemed to be a delay, so after several weeks, I went to Washington and commented to Senator Hayden that I was awaiting clearance to take up this United Nations job that for some reason was being held up. Senator Hayden immediately took the phone and had his secretary get headquarters for such clearances.

I overheard him say, "I've known Walter Lowdermilk since he was a boy and his father before him. I will vouch for him and I want him cleared immediately to take up this important U.N. job." Within the hour in Senator Hayden's office, I received my papers.

The next day found us establishing ourselves at the Beaux Arts Apartments, a block from the United Nations headquarters. I began work at once in an office on the twenty-sixth floor overlooking the city of New York, with excellent secretarial help put at my disposal.

My basic assignment was to develop a coordinated water policy and program for the U.N. Apparently for some time there had been international sessions on water policy that pointed up the fact that there was not a uniformity in methods of dealing with water problems, and that there was a lack of understanding of data to be collected and a lack of any example of integrated river basin development that could be used as a pilot project.

Concern For Rivers Shared by Two or More Countries

Chall: How did you begin this new work at the United Nations?

WCL: First, I wanted to acquaint myself with what had been said in meetings and written in reports, and I studied the large scale projects that had been set up in different parts of the world. I was especially interested in those that involved rivers shared by two or more countries and involved international solutions in boundary disputes.

These boundary disputes highlighted the desirability of establishing procedures to be followed by nations, or groups of nations, to determine adequacy of data and to plan management of water resources that would meet the requirements of all nations involved.

This is something that I have been advocating for years: that disputes between nations over water rights should not be settled by political expediency, which has so often been done in the past; instead, solutions to such problems should be based on sound engineering.

Therefore, from the first, my principal theme was that the United Nations should undertake the task of engineering the potentialities of river basin developments that are shared by two or more countries for the benefit of all concerned, rather than for one nation to plan river development for the benefit of one nation or the glory of one dictator.

Critique of the Aswan Dam

Chall: Can you give us such an example?

WCL: Yes, I do not know of another example that is better than that of Nasser's Aswan Dam. This, to me, even from Egypt's standpoint, is hydrologically unsound, and not economically advisable. In the first place, the Aswan Dam is located in the hottest, driest portion of the world. Evaporation of waters behind the dam will amount annually to a loss of about one-third of the water supposed to be for irrigation.

Again, this dam, to give Nasser prestige and glory, will inundate more than fifty thousand acres of excellent farm lands that have grown food for the local population and for export elsewhere. Furthermore, the lake backed up behind the dam will

WCL: also inundate cities and towns maintained by the surrounding fifty thousand acres of good farm lands, and this too is a big loss to the region in removing and resettling all sixty thousand people living there.

Of interest to the world at large is that this dam and the lake backed up behind it will flood some of the fascinating relics of early man in the Nile Valley. Millions of dollars from countries around the world have been contributed, especially from the United States, to move to higher ground some of these huge antiquities.

I have a theory as to why some of these huge tombs and temples were built. Perhaps early in man's life in the Nile Valley, some clever farmer hitched an oxen to a hoe and for the first time applied power to agriculture. Then fewer people were required to grow the food and there was great unemployment. Perhaps the Pharaohs were the first to use what we called W.P.A. projects, to put men to work as we did in our great depression in the early 1930's. These huge works of early man of antiquity should not be buried and lost to mankind by being inundated.

But under the program of planned river basin development this Nile Valley could become a model for integrated river development that would greatly benefit all the four nations touching its boundaries--Egypt, Ethiopia, the Sudan and Uganda--and it could deliver far more water to Egypt by what is called the Century Storage Plan. I discussed this in Chapter VIII.

Many times I have said that I found the lands of the Nile among the richest on earth, yet they have the poorest, most poverty-stricken farmers, who suffer from several debilitating diseases. This rich agriculture through the centuries has largely benefited the few great landlords.

Nasser has made a beginning of doing more for the farmers, but basic land reforms are a requirement for the new Egypt. Also the present population explosion nullifies all gains of the Aswan Dam in increased land for irrigation, for during the time of construction, more people have been born than food can be grown on the new lands it will bring under irrigation. The 1968 Reader's Digest Almanac and Yearbook states that the per capita annual income in Egypt is only $135. Tragically, Egypt spends billions on armaments instead of benefits for her people.

So one can see how important it is for this planet (on which demographers tell us there will be more than seven billion souls before the end of the century) to develop long-range planning on all important river basins that are shared by two or more countries. They should be developed for the greatest benefits for all concerned. Does this make it clear why I feel that it is a calamity

WCL: for the United Nations to delay in this important challenge of engineering the potentialities of all such rivers for integrated development for the benefit of all nations concerned?

Development of the Jordan River Thwarted

Chall: Did you make suggestions as to what river basins should be engineered for full use of all their potentialities for the benefit of all nations sharing the same river?

WCL: Well, of course I would have liked to use the Jordan River as a pilot project. My proposed Jordan River Power and Irrigation Project had been engineered in 1944. Its cost at that time would have been only 250 million dollars and would have paid itself off in fifty years at three percent interest.

Our Department of Interior offered to put up the funds but this was turned down by the British who then had the Mandate of Palestine. The Arabs refused to do anything that might benefit Israel, even though it was detrimental to their own best interests.

To show the Arab animosity: I was told by a permanent member of the United Nations that shortly after I had been called in to work on an over-all water policy for the United Nations, the various Arab ambassadors in the United States came in a body to the United Nations and presented themselves to Dag Hammarskjöld, then Secretary General, to protest my being in the United Nations because of my plan for a T.V.A. on the Jordan.

They feared I would not work for Arab interest. They claimed Israel had no interest or rights to the Jordan valley waters, for the nation did not exist--an absurd position.

I was informed that the ambassadors were told in no uncertain terms that I was not working on any particular water or river basin problems, but on an over-all water policy for the United Nations as a whole, and in polite, diplomatic language they were told to mind their own affairs. So of course, even though this T.V.A. project was small, feasible and clear-cut, it could not be made a pilot project because of political reasons.

Suggestions for Tigris-Euphrates Basin

WCL: However, I did suggest the basin of the twin rivers--the Tigris-Euphrates Rivers--that is shared by three countries: Turkey, Syria and Iraq. In this river basin the relationships between countries concerned were friendly and plans for integrated development could normally proceed without much difficulty. The people were largely of the same background, language and religion, except for people of Turkey, far to the north, whose benefits would largely be electricity from hydro-power and dams that would be beneficial in flood and erosion control.

Also, these nations lying in this great Tigris-Euphrates river valley were in possession of great wealth in oil and could count on ample funds for the development of the potentialities of this basin.

In my studies there in 1939, I estimated that Iraq could support, with a good standard of living, ten times the population at that time of something over five million people, who had a very low standard of living.

If the Tigris-Euphrates river basin could have been made into an integrated river basin demonstration area, it would have had great benefit. These countries are in a region whose lands have been very seriously damaged by erosion and silting and salting up during the past several thousand years. These serious problems require expert study and assistance.

U.N. Prefers Mekong Delta

Chall: Did the United Nations accept your suggestion of making the Tigris-Euphrates river basin the pilot project?

WCL: No, for the authorities at the United Nations decided for some reason that it would be a better plan to make the Mekong River, far off in southeast Asia, the basis for a demonstration or pilot project. So they began elaborate undertakings and surveys and collection of basic data to serve as the basis of planning and works and measures to derive the most from a river of wide variations in flow because of monsoon rains.

Instead of this river basin being quiet and peaceful as

WCL: they thought, it has become the scene of some of the most bloody and destructive warfare that mankind has yet experienced. The unhappy fact that in our twentieth century wars may suddenly break out in unexpected parts of the world makes it all the more important that the United Nations take positive steps in engineering the possibilities of resource development of the many main river basins of the world that are shared by two or more nations.

This would serve as a basis for collaboration of countries concerned, so that solutions can be based on sound engineering facts rather than political expediency. This may tend to reduce the threat of war in some instances.

Other Assignments

Chall: Did you have other special duties at the United Nations?

WCL: Yes, for the Technical Assistance Board, called T.A.B., referred to me many of the proposals for projects in technical assistance to less developed nations. I was to read and evaluate them and recommend whether action should be taken or not. This required a great deal of my time. Funds for these projects, when approved, were provided by special funds which were dispensed by the Technical Assistance Board.

Another responsibility given me was to formulate a program of action in development of methods of gathering information and making surveys for studies of water resources in integrated river basins. We were expected to work out evaluations of water resources and their conservation and utilization.

Since F.A.O. (Food and Agriculture Organization) was responsible for development and distribution of water in agricultural uses, our water unit did not invade the field of F.A.O., but correlated our activities with theirs.

This, however, gave us ample room for the development of water resources not used in agriculture, such as water used for hydro-power and for navigation, and for flood control and drainage. We took a look at the entire field of water resources, their development, distribution, control and conservation.

We called meetings from time to time to evaluate progress made in different phases of the water problems. We assembled specialists from various nations of the world to come together

WCL: occasionally to study the status of the water situation. So we built up a roster of agencies, both international scientific and within the United Nations organization, to provide for interchange of information and to report on the progress of such activities.

Colleagues

Chall: Were your associations at the United Nations a pleasant experience?

WCL: Yes indeed. It was always an interesting experience to go through the halls or into the spacious delegates dining room overlooking the Hudson River, and see representatives of some one hundred different nations of the world, some in native costume, and from time to time be introduced to some of them and discuss with them some of their water problems.

I had especially fine relations with my immediate boss, Father de Breuvery and with Dr. Joseph Barnea, with whom I worked closely. There was a fine esprit de corps in our water resources section. I knew my colleagues well and also had the opportunity of meeting very many water specialists and engineers from many parts of the world.

In all my months at the United Nations headquarters, I had only one disagreeable experience and that was when I was hurried to the New York Hospital to have a bout with a surgeon. I was in the hospital for a month, then had a period of recuperation in California. Then I returned to the United Nations for a month to complete my report and recommendations before leaving for my second assignment in Israel, under the F.A.O.

A YEAR WITH THE UNITED NATIONS, 1954

[Taped questions and answers]

Dr. and Mrs. Lowdermilk Caught in the McCarthy Fly Trap*

Chall: I want to talk to you today further about your year with the United Nations. But first I would like to ask why it took so long for you to get clearance to take the job. You only touched on it very lightly in your written answers to questions. You have been very hesitant to talk about this, but it concerns an important period of American history and I would like to know more about it.

WCL: Well, this was a period of witch hunting in the United States. Some people were sure that communism was infiltrating our government to take it over and everyone was suspect. Even though completely innocent of any thought, action, interest or sympathy with the Communists, they might be suspect; and you might be suspect if you had a friend or a relative who might have at one time been sympathetic to the Communist struggle.

One very bad feature of this witch hunting was that one was never permitted to know who one's accuser might be. It reminded me of our studies of the witch doctors in Africa. If one wanted an enemy destroyed or had a grudge or wanted revenge, he went to the witch doctor, who managed these things very efficiently and the victim never knew who was wanting to punish or destroy him.

This was the case in the United States at that time. People were encouraged to report to the McCarthy headquarters any suspicion of communism among people of influence, especially in any government office. Thus you can see that when there were jealousies and someone wanted to prevent another from advancing or get him out of the way, it was very simple to hatch up some evidence to suggest that this or that person might have Communist interest or background.

Chall: How did you happen to become involved?

WCL: I had been appointed to work at United Nations headquarters for a year and was waiting for my clearance which seemed unduly delayed.

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*Heading suggested by Mrs. Lowdermilk.

WCL: Then just two days before Christmas, 1953, I received a letter enclosing a questionnaire, indicating that my wife and I were under suspicion of disloyalty.

This was undoubtedly the most stunning blow that had ever come to me in all my years of devoted work for my government. We were given ten days to reply. No name was signed, but the reply was to go to the Loyalty Board.

Accusations Listed

Chall: Did they state what the accusations were about?

WCL: Yes. As you know, we had lived in China and were sympathetic with the Chinese people and their sufferings under constant bombing by Japanese planes. We had worked and talked against our selling scrap iron to Japan and providing her with everything but the aviator to bomb the defenseless Chinese cities. But England was trading with Japan and we too wanted trade so no one paid attention to us until after Pearl Harbor.

It was during this bombing period that my wife spent much time and effort to either donate money or raise money to send hundreds of small cartons of dehydrated foods and boxes which included some thread and needles.

She belonged to a group that called themselves "Committee for a Democratic Policy for China"--I believe this was the name. This organization dispatched the small cartons in wooden boxes by freight to various Protestant and Catholic mission stations in China. There was not the slightest suggestion that there was any Communist infiltration into the organization at that time, but it was reported that later, after we moved away, there were some Communists in it, but we have no knowledge of it.

Chall: Do you mean that they would think this was sufficient cause for making accusations against Mrs. Lowdermilk? Was this all the basis they had?

WCL: Well, the other was equally without foundation. When I was in Chungking in 1942-44, sent by our government, I became acquainted with General Feng U Hsien, the so-called Christian General. He gave me a big reception.

Later, in 1946, he and Chiang Kai-shek were at outs. Chiang considered Feng a traitor. But Feng was so popular with the people and his soldiers about worshipped him. So Chiang dared not dispose of him.

WCL: Therefore, Chiang gave Feng $100,000: $60,000 for himself and $40,000 to pay his expenses for a study of dams and irrigation works in the United States. He had two engineers and two Chinese secretaries, one for English writing of letters in America and one for Chinese writings to send back his newspaper columns to China.

The government asked me to work out his itinerary because of our acquaintance. The General wanted to remain in the Bay Region for a couple of months to learn English and get accustomed to the country. Since he had given me a reception in Chungking, I wrote to my wife in Berkeley, who was there for the year while our son was in the University, to arrange to give him a reception.

She had about forty leading civic and church leaders attend. This led to her allowing General and Mrs. Feng to have two rooms in our house for the two months and make our home the headquarters for his engineers and secretaries, for whom my wife secured lodging in homes of other professors nearby.

I accompanied General Feng on the first part of the itinerary, but he did not want to continue the strenuous schedule. So we called it all off. He was actually not interested in dams and irrigation, but did as he pleased.

Somehow word got around that the General and Mrs. Feng had Communist interests. When he left the United States, he returned to China via Russia. But there was a very suspicious accident on board the Russian ship and while he was showing his films, they caught fire and he and his daughter were burned to death.

No one knows the details, not even his son by his first wife, then in Berkeley. Mrs. Feng went on to China and became head of the Women's Democratic League under the Communist regime.

So it was this friendship that was also used against my wife to imply that she might be disloyal. In all the close association in the home, my wife, who then spoke Chinese fluently, said she never heard a word as her Chinese guests were speaking to one another to imply that they might be Communists, except that the English secretary, Mr. Liu, after his year in America, seemed disgusted on leaving and might have turned Communist while here in the United States.

Chall: Certainly it must have been easy to have Mrs. Lowdermilk cleared, but what did they try to use against you?

WCL: There is a fine camaraderie among old China hands, and through our Quaker friends, the Wagners, we met another Quaker, named Owen Lattimore. I discussed my idea of northwest China being desiccated and largely depopulated because of soil erosion due

WCL: to man's misuse of the land in those easily erodable loess soils. I called it a "man-made desert."

Owen Lattimore was very interested and asked me to write an article by that title for a magazine called Pacific Affairs, of which he was editor.

I wrote the article and it was published and created considerable interest. Years later, someone accused this magazine, Pacific Affairs, of being communistic and Owen Lattimore was viciously attacked.

Since I had written an article for his magazine and our families were friends because of our years in China, then it was used by my accuser to imply that Owen was a Communist; then I must also be contaminated, for we were friends.

In early days in New England, we burned witches, but no physical burning was more painful or as devastating as these ordeals that fine men were put through during these Communist witch hunting days under Senator McCarthy.

When I last saw Owen Lattimore, he was an old and broken man because of his ordeal, though he was fully cleared later.

Then too, they accused me because of my acquaintance also with General Feng. But the chief reason for suspicion against me was because of the article on man-made deserts published in a magazine that was years later, along with its editor, declared communistic. But later, both Owen Lattimore and Pacific Affairs were cleared.

Chall: Do you mean that this is all on which they based your disloyalty?

WCL: There was just one other thing which was certainly stretching the point, I thought. This was the time when England, who had been helping Greece with military and some economic assistance, found the financial burden too heavy and so turned Greece over to the United States.

We followed England's policy and were giving military help and aid in food to Greece. We heard that there was great suffering in Greece and so we sent one of our S.C.S. men, Fred Renner, a grazing man, to look over the situation on the ground. He found the people in the cities well clothed and apparently there was an abundance of food and wrote back accordingly.

Then Renner went out into the country. Generally, rural Greece is hilly or mountainous. He found the lands overgrazed and very badly eroded everywhere. The peasants were desperately poor and undernourished. Nothing was being done for them,

WCL: whereas the urban areas were being well provided.

I then wrote a very strong memorandum to our United States government, that our extensive aid was only reaching urban areas and was ignoring the long exploited peasants.

Then I suggested that America devote her attention to the farmers and peasants. I said this was an opportunity for us to do something for the poor farmers, that we had the technical know-how, the experts to direct such works; we had the equipment, the improved seeds, and knowledge of fertilizing and successful methods had been worked out by our own Soil Conservation Service. I stressed that this was far more important for Greece than to supply her with more military aid to fight the Communists.

But this was a time when Russia was claiming to be the champion of the peasant and the poor or the common man. She was proclaiming that she would assist the downtrodden and exploited masses of the world to a better way of life.

So when I championed the cause of the poor peasant farmers of Greece, trying to eke out a living on their eroded lands, I was accused of advocating Communist doctrines and therefore could be suspected of being disloyal.

Clearance

Chall: Did it seem to you that someone may not have wanted you to have the United Nations job and had put you under suspicion so that the Loyalty Board wouldn't clear you, and you could do no more work for the government?

WCL: That appeared to be it. We sent in the questionnaire and waited and waited. We wrote and no reply. I asked for a hearing or to face my accuser, but no reply. Finally, in desperation, in February, I went back to Washington and went to Senator Hayden's office and explained my situation.

He hardly waited for me to finish before grabbing up the phone and contacting the Loyalty Board. He said, "I want you to clear this man Lowdermilk at once. I have known him since he was a young man and his pappy before him, and I will personally guarantee him."

Things moved fast then, and while I was still waiting in Senator Hayden's office, I was cleared and the next day I received my papers and could go at once to my new job in the

WCL: United Nations headquarters.

Chall: Can you remember your emotional reactions to this accusation of disloyalty?

WCL: I was crushed. I felt despondent. I couldn't eat, and I couldn't sleep. I used up a great amount of energy pacing the floor, and I remember too that I was very angry.

I'd spent all my career working for people on the land. I felt that I understood some of the important forces that are at work in our civilization; and so I felt that if people really understood what I had been trying to accomplish throughout my working life, there wouldn't have been suspicions.

Also, you get the feeling that somebody has set a machine going which you don't know how to shut off and which can do all sorts of harm to innocent people. You are inclined to lose faith in your fellow man--and this isn't my usual attitude.

Chall: Your clearance must have been a very great relief to you.

WCL: Yes indeed. One hears of other s being accused of disloyalty, but one feels it cannot happen to you. No one can ever know what such things do to an innocent and patriotic person unless they too suffered during this unhappy period of our history. But I was fortunate. I only had a short period of suffering, but I know others who were thrown out of their jobs and could not get another government position and were just completely crushed and broken.

Only later, after the McCarthy period was over and he and his sleuths were discredited before the country, were these men completely cleared of any suspicion of communism.

One of our S.C.S. men, Dr. Thornthwaite, one of our research men, was also crushed by an unwarranted accusation. He was out of work for several years and died an early death, undoubtedly because of it.

I talked to him and said that if there was anything I could do to help him to let me know. The tears came to his eyes as he replied, "You are the first one who has even been willing to talk to me." It actually was dangerous to talk to anyone under suspicion for fear you too would be placed under suspicion.

Chall: Did this experience prevent you from entering whole-heartedly into your work at the U.N., or were you still fearful?

WCL: No, I do not think it did. I knew I was innocent and I had been cleared, and I seemed to have a rebound of thankfulness.

ADDRESS ONLY
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IN YOUR REPLY REFER TO
FILE IL3-[illegible]
AND DATE OF THIS LETTER

UNITED STATES CIVIL SERVICE COMMISSION
WASHINGTON 25, D. C.

February 25, 1954

The Honorable

The Secretary of State

(For transmission to the Secretary General of the United Nations)

SUBJECT: Information furnished under Executive Order 10422, as amended by Executive Order 10459, with respect to: Walter Clay Lowdermilk, born July 1, 1888. Applicant - United Nations, New York, New York.

Sir:

The person named above, who has been reported to be a United States citizen employed or under consideration for employment by the foregoing public international organization, has been the subject of a full field investigation under the provisions of Executive Order 10422 of January 9, 1953, as amended by Executive Order 10459 of June 2, 1953, and the report or reports of investigation have been duly considered by the International Organizations Employees Loyalty Board.

It has been determined that, on all the evidence, there is no reasonable doubt as to the loyalty of this person to the Government of the United States.

Sincerely yours,

Pierce J. Gerety

Pierce J. Gerety, Chairman
International Organizations
Employees Loyalty Board

By:_____
Executive Secretary

~~Attachment~~: ~~Identification and~~
~~Personnel Data Form~~

CC: Mr. Lowdermilk

Chall: Did you ever find out who your accuser was?

WCL: No, that was never permitted. We had definite suspicions, but without proof, we dropped it from our minds. In fact, we have tried to forget the entire affair and have only discussed it here at your special request.

United Nations Activity in Mekong River Basin

Chall: So you quickly received clearance and began your year with the U.N. Secretariat.

WCL: Yes, and I want to show you a report that has just come in from southeast Asia.*

Chall: Oh, the Mekong basin. Can constructive work be done when the country is at war?

WCL: The war is scarcely ever mentioned in the reports. These regular reports I get keep me in touch with what is being done. This study and work in the Mekong basin is the result of one of my recommendations in the U.N. study.

You remember I made a recommendation that the U.N. should engineer the development of water resources in important river basins shared by two or more countries. And that such engineering should be carried out far enough to determine whether projects were feasible or not, so that diplomats, when discussing matters regarding such developments, would have engineering facts available to them in negotiations, rather than deciding by political considerations or acts of expediency. Usually political factors interrupt, damage, or disturb the orderly development of resources.

Chall: What is the United Nations doing in the Mekong Delta?

WCL: They are gathering information of many kinds and making more and more detailed maps for dams. Apparently, most of their work is now in Laos and Cambodia.

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*United Nations Economic Commission For Asia and the Far East. United Nations Economic and Social Council; January, 1968.

Chall: Have you any idea of how many people are out there?

WCL: I don't have a roster of all the staff. Dr. C. Hart Schaaf, with whom I worked for several years in Israel, is now the Executive Agent--which is a new term chosen for this particular project. He represents the United Nations in developing plans and in financing.

Of course, one of the big jobs is the financing of this type of work. The Japanese, for example, as their contribution were called on to determine the hydrologic characteristics of the Mekong River, measure the stages as they vary with the seasons.

Chall: What country is C. Hart Schaaf from?

WCL: He's a U.S. citizen, from Michigan, I think. He is very good at getting together people representing different countries and directing them to work together. With so many different interests and personalities involved and different types of approach to various serious subjects, it takes a man with quite an agile, skillful mind and temperament to get people from independent countries to work together on a long-range project like this.

Actually, they are following my recommendation for this type of work except I suggested, you remember, that they should do this on the Tigris-Euphrates. Instead of that quieter area at that time, they chose the Mekong, that since then has become a tragic war zone.

Working Arrangements in the U.N.

Chall: Have you any idea where the decision was made to choose the Mekong rather than the Tigris-Euphrates valley?

WCL: No, I don't know. I think the TAB would have had something to say about it. The workings of the U.N. organization are very interesting. There is an inner sanctum room where things are discussed. One gets rumors that they favor or disfavor certain ideas and changes are made.

Chall: Could you compare this kind of arrangement, working in the U.N., with, let's say, the bureaucratic problems in Washington where you had to deal with the Department of the Interior and the Department of Agriculture and all their bureaus, and agencies?

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Chall: These special groups are often almost more important than the departments.

WCL: In the U.N. no nation is required to do what somebody tells it to do. And no one tells a country what it is supposed to do. But I found that when we become well acquainted with our counterparts, we could say that if we did this, or if his country did that, it would be an advantage, or would multiply the benefits.

We might start out with a single proposal, then say: If you, or we, will do other things, that may help bring about a more complete development. In that way we could be an influence in broadening the scope of our studies.

I found the U.N. willing to respond to logical suggestions. My idea in formulating an over-all water policy for the U.N. was to develop something logical and constructive that would give us an opportunity to do a more complete job.

Chall: Now when you say counterpart, who are you talking about?

WCL: Counterpart is the person who works with the official representative of the U.N. He is supposed to do the work while the U.N. man is an advisor, a consultant.

Chall: First you deal with the counterpart, as you call him, hoping he will accept your proposals. You say, there are other groups within the United Nations whose ideas come to you, but you can't argue with them because you don't know who or where they are.

WCL: For instance, sometimes we work out a scheme to do certain things. Then representatives of some country who feel their interests are going to be jeopardized go to their own representative and request that he go to the U.N. and say, "We can't agree to have this done because ....." Then of course we cannot go ahead without U.N. permission.

Now, the counterpart is the person from a country that works directly with the representative of the United Nations. Nathan Gil was my counterpart for this development of our soil conservation program and for training personnel in that F.A.O. project that I was engaged in for nearly three years in Israel.

Chall: Is counterpart United Nations terminology?

WCL: It is pretty generally accepted in the United Nations. In our Point Four program we have the same concept of counterpart. They also have what they call counterpart funds. These are important because they represent money of the country which has been paid to the United States for technical assistance, such as building a dam, or a supply of food. The United States, out of its

WCL: generosity, in this case doesn't require the country to convert its money into dollars, which would be a considerable loss to the country. The United States accepts local money of the country for these services.

These funds cannot be spent out of the country so this special fund builds up money to be used within the country. The money cannot be spent unilaterally, but it must be spent on agreement of both the United States representative and the representative of the country being helped.

These funds often become very important because they reach large sums that can finance considerable undertakings without further appropriations from the United States. It is a device that is all to the advantage of the country that's being helped. The only advantage to the U.S. is that we think we are making friends.

Dr. Lowdermilk's Report

WCL: In my report, I analyzed the problem and indicated what would be a normal development of interests that the director of the U.N. would want to carry out under the ECOSOC resolution (Economic and Social Council of the United Nations).

My method of working was quite unusual, they said, because I realized few understood very much about water. It was such a new subject to many that I felt one of the first things they needed was a clear terminology, so that we'd all understand what we were talking about. So I spent a great deal of my time just writing what you might call elementary hydrology. They were apparently very interested.

Then when we began to suggest things to do, I proposed that we set up a water unit at the U.N. to take care of matters that would come under the heading of water in its various aspects in the development of countries and resource developments.

Some agreed but others weren't so sure, because it was something that would involve much more. Of course, you see, we'd get immediately into water rights across international boundaries and that question is a very tough one. So they were slow to act.

There was so much to do just to acquaint myself with U.N.

WCL: procedures, and to acquaint the U.N. people with whom I was going to work with a knowledge of water in its many aspects. In fact I was busy at this for all the time I was at the U.N. headquarters. If nothing had been done though, I would have found it very unsatisfactory, but I do know that some of my recommendations were accepted and carried out.

Also we came in touch with quite a group of U.N. people and presented water problems to them in a basic way that they could understand. I was quite satisfied with the responses that I got.

Chall: I see. Maybe there will be a long-run effect.

WCL: Yes. It's a long-run effect. But it was a satisfaction to work where people were willing to work with vision and were serious and intent on getting something done among nations.

Colleagues

Chall: How does it happen that Father de Breuvery, a Catholic priest, would have so important a place in a purely lay organization like the U.N.?

WCL: Father de Breuvery was the first of the Jesuits to be trained in the broad field of economics and was assigned to the United Nations as a representative from France. He was an able and brilliant man.

He had been working for some years with the Sicawey observatory in Shanghai, on problems in China. So we were both old China hands and had much in common.

We worked together well, and I enjoyed my friendship with him very much. I was appointed consultant to him on water matters in the Natural Resources section of the U.N.

Life in New York

Chall: How did you like living in New York City? It must have been

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IN REPLY
PLEASE QUOTE NO.

4 February 1955

Dear Dr. Lowdermilk,

On the last day of your assignment as a consultant to the United Nations, I wish to let you know my personal feelings about our association and, at the same time, express to you our appreciation for the valuable contribution you have made to our work here.

The nature of our task, and of your assignment in particular was such, that it required technical competence and international experience. Above all, however, what was needed were the human qualities of patience, tact and imagination, for it was necessary to reconcile often opposed views of specialized agencies, to alleviate their fears against the idea of "being co-ordinated", and to bring about a positive, constructive approach of all concerned towards the new United Nations programme.

You have done all this. You advised, but you never imposed your advice. You were always ready to accept new ideas, to adapt your thinking to a new approach, if such a change was to bring us nearer to our aim.

The same human qualities which made you come to your daily work in high spirits and helped you perform your duties made you dear to us as a colleague and friend. You have become for us a real "model" of an international consultant.

I personally will miss your competent advice, I will miss you as a colleague, but I hope that our association is only temporarily at an end and that you will find it possible to serve the United Nations again. Until then I wish you continued success in your new duties.

Finally, let me repeat to you that, when you go, it is a very dear friend indeed, who is departing.

E.S. de Breuvery
Chief, Natural Resources Section
Bureau of Economic Affairs

Chall: quite a change for you.

WCL: We immediately rented a very pleasant apartment in the Beaux Arts Hotel a short walking distance from the U.N. office building. I did not mind the warm weather for I had an air-cooled office on the twenty-sixth floor, overlooking New York City.

But I think the winter time is terrible. The cold north wind blows down those sunless marble or concrete canyons. The U.N. building is so high and so wide that when these strong cold winds hit the building, they deflect downward onto the large plaza across which one has to walk about a block from street to the building, with no protection. The wind sucks away one's breath and tries to tear away one's coat.

But my contacts were pretty much within the United Nations building and except for the short distance to and from the U.N. I was little affected by the weather, and I wanted to get as much done as possible, for my appointment was only for one year.

XV THE YEARS IN ISRAEL, 1951-1964

Part I Developing the Soil Conservation Service, 1951-1953

[Written questions and answers]

Chall: You told us of your experiences in Palestine in 1939. How did you happen to go to Israel in 1951 to start a Soil Conservation Service?

WCL: We had just spent a year of studies south of the Sahara in Africa, financed by Carnegie Corporation and sponsored by the British Colonial Office and the British and American Missionary Societies. Our task was to awaken officials, missionaries and natives to the problems caused by the rapid deterioration of their lands due to ignorance, neglect and the onrushing population explosion, and to evaluate British programs of improved agriculture.

On our return journey, we stopped over in the new State of Israel for three weeks. As in 1939, the winter rains were on, and the Mediterranean was a chocolate brown to the horizon with soils washed from the hills of the Holy Land as had been going on for centuries since the Arabs and their goat herds had taken over the land.

But this time it seemed different and more tragic. The national homeland for the Jews in Palestine accorded by the League of Nations with England as the Mandate, was no longer padlocked against Jewish immigration by the British White Paper. The State of Israel was now recognized by the United Nations and was a member of this world body.

At this time, forty to fifty thousand homeless Jews were pouring into the new State each month. I said to President Weizmann, "You cannot have an increasing population on decreasing productivity and annual loss of your remaining soils. What are you going to do about it?"

President Weizmann sadly shook his head as he said, "We are swamped, trying to feed, house and find jobs for these tragic refugees pouring in from Hitler's Europe and from persecution in Arab countries. We have no money and furthermore, we have few, if any, trained to do this kind of work."

My wife remembered that eleven years before, in 1939, I had

WCL: looked upon this wastage of soils of the Holy Land in each rainstorm and remarked that the thing I would most like to do when I retired from the United States Department of Agriculture, would be to return to Palestine and put farming of the Bible lands on the contour and stop this age-long erosion.

At that first visit, my wife also had been deeply moved by the human aspect of the closed door of Palestine to Jewish refugees and had visited one of the cargo boats packed with human beings, that put ashore in Beirut for a few days. She heard the stories of some of these refugees from Czechoslovakia fleeing Hitler. They had floated for eleven weeks on a little one-funnel freighter along with 655 others, existing on one meal a day of beans, lentils or rice, and all had scurvy as a result of no fresh food. Yet they were among the most talented and substantial people of Europe--musicians, doctors, lawyers, nurses, and staff officers of the national Czech army.

At that time, my wife said, "It is long past due for the Christians to give the Jews a new deal, and I'm going to try to do something about it." She returned to the United States to do much speaking and to raise money to rescue European Jewish orphans under the Youth Aliyah program of Hadassah, and was one of the founders of the American Christian Palestine Committee.

Dr. Lowdermilk Offers to Work in Israel

WCL: So we both at once responded to the opportunity to put our dreams into action. I went to President Weizmann the next day and offered my services for a year, without salary, but with expenses, to start soil conservation work in Israel as I had done in our own and several other countries. He accepted my offer and we made plans to return to Israel as soon as other commitments were completed, which was not until after I had worked for the year on Truman's National Water Policy Commission and been an advisor on flood control in Japan under General Douglas MacArthur. So it was mid-year of 1951 when we finally reached Israel, as a dollar-a-year man--without the dollar.

Chall: How did you start in this new work in an old land?

WCL: We had quite a handicap at the first. The three sets of earth-moving equipment and jeeps and trucks for transportation were not awaiting our arrival as expected. When Mr. Kaplan and Golda Meir were in New York arranging for a $200,000,000 agricultural

to various governments. I would like to come to Israel now and help you with your agricultural problems.

Weitzman: Ever since your first visit, Dr. Lowdermilk, I have wanted to ask you to come. But there is a very good reason why I haven't.

Dr. L.: What reason?

Weitzman: We are a poor country. We operate, as you say in America, on a shoe-string.

Dr. L.: Dr. Weitzman, I am *offering* my services.

Weitzman: I don't understand.

Dr. L.: I want to give the state of Israel my services for one year. (A PAUSE) Will you accept them?

Weitzman: I have seen a great deal of the world, Dr. Lowdermilk. I had thought that I could no longer be astonished by anything. You astonish me. (PAUSE) Why do you wish to do this for my country? You are not a Jew.

Dr. L.: No, I'm not a Jew. Maybe that's why. I was a witness to what has happened in the world. You were the victim. This may sound pious — but let me put it this way. If I can help to make the earth of Palestine a little richer for the children who will inherit it, then maybe the dead children will rest a little more quietly in their graves.

(A PAUSE)

Weitzman: (MOVED) I accept your offer. When can you come to us, Dr. Lowdermilk.

(Music: BRIDGE & OUT INTO:)

Man: (SLIGHT ECHO) For the last two and a half years Dr. Lowdermilk has made Israel his home. For almost a year he donated his services to the Israeli government. After that time he was appointed to the Food and Agriculture Organization of the United Nations, and assigned to continue his work in Israel. Tonight it is with great pride that we announce that next September Dr. Lowdermilk will again return to Israel. He will return this time as the head of the new Agricultural Engineering Department of Technion, Israel's University for training technicians in the applied sciences.

(APPLAUSE & DOWN BEHIND:)

Mrs. L.: I am sitting beside him, the guest of honor. I am where I have been for the greater part of our lives.

(Music: SNEAK)

I sit at the banquet table and I remember the Gibbs' and the dead Chinese baby and David who never got to Palestine.

Czech Woman: (VERY SLIGHT ECHO) His name was David. It means Beloved. You can tell them that was my baby's name.

Mrs. L.: They are here too. And whatever he has done, my husband. Whatever he will do — they are the reason. There is a

From broadcast, The Eternal Light (NBC), "Prophet in Dungarees," a dramatization of the reasons why Dr. and Mrs. Lowdermilk offered to live and work in Israel for a year without pay. January 10, 1954.

WCL: loan from the United States, we had gone from Washington to New York to request $200,000 worth of equipment so as to have one set for the north, one set for the coastal plain and one set for the southlands. Both agreed that we should have these sets of equipment and told me to submit an itemized list.

But through a mix-up at the Israeli Embassy in Washington, instead of our equipment being purchased, pipes for irrigation of kibbutzim were ordered and we found ourselves with absolutely nothing but my own personal car which we had donated but on which Israel had paid the freight.

This indeed was a great disappointment. The newly established Soil Conservation Service was the smallest department in the government and had the least budget, which allowed for no new equipment. But I cannot resist telling you now that when I left after two and a half years, it was the biggest department in the government and had the largest budget.

Starting to Work

Chall: Then how could you do any constructive work with no equipment?

WCL: Well, first I wrote letters and sent off cables to some of my Christian and Jewish friends, asking for jeeps and small trucks so that we could get men and equipment out into the field. The first two jeeps were donated by Reverend and Mrs. Burgoyne Chapmen, who were Christians living at Mishmer Haemek at that time. Before too long, we had, as my wife likes to put it, five Christian jeeps or trucks and five Jewish ones.

There was such an enormous amount of work to be done, but we could only begin on things that could be done with the money and equipment available. Many unskilled were arriving from Yemen and other African or Near Eastern countries, and these people needed to be put to work. One of the immediate jobs was getting these men into the field with picks and shovels to put check dams in little erosion gullies forming in fields to prevent further washing of soils into larger streams.

This work was also good for the newcomers, who, for the first time in their history, could work on their own land, in their own country--which gave them great pride in their work and love of the land. They were excellent workers as far as their knowledge went. The job was tremendous and laborers were

WCL: plentiful, but we were handicapped for lack of funds to pay the men and for lack of supervisory personnel.

Another recommendation I made immediately also could put unskilled men to work. Palestine in ancient times had been called a land flowing with milk and honey, which implied a pastoral paradise. But long ago, goat herds had grazed out the ancient natural nutritious grasses so there was immediate need to reseed the range lands.

I suggested that laborers among newcomers be put to work gathering the few grass seeds still found in cactus plants where goats could not get at the grasses and they had gone to seed, in compound walls where grasses grew undisturbed, and around the edges of thrashing floors where grain seeds dropped but the lighter grass seeds blew out around the edges.

Soon sufficient quantities were collected so that we could establish a grass nursery, and soon it was producing these fine old grass seeds by the tons to reseed the range lands. "Operation Cowboy" was begun up in Galilee.

All of Israel's meat (aside from chickens) had to be imported at great expense. Jordan could produce the beef and mutton for all of Israel and in return get from Israel many things needed in a new nation, but the borders bristling with military prevented this beneficial exchange.

Chall: How did you find capable men to direct the work of the newcomers?

WCL: Fortunately, there were many good agriculturalists among the pioneers, especially in the kibbutzim, who had spent years draining swamps, rebuilding terrace walls, de-stoning valleys of boulders washed down in winter storms. They were idealists, eager to reclaim their ancient homeland. Some men from South Africa had training. Apparently few had much knowledge of soil erosion or what to do about it, but they were eager to learn.

Talking About Erosion

WCL: However, even the best educated among both old and newcomers in Israel were lacking in knowledge that it was soil erosion that had ruined the country through the centuries of neglect and had swept off at least three feet of soil from all the hill lands of Judea and Galilee and left the piles of stones behind.

WCL: I wrote ten articles on soil erosion, what it is and what it does and what to do about controlling it, that were published in the Jerusalem Post and translated into certain Hebrew papers. Also I gave a talk on the radio entitled "Gone With the Rain."

I remember I said that the agricultural school at Midrasha was a disgrace, with gullies resulting from plowing up and down slopes instead of on the contour. That week I got many calls. This was humiliating for the agricultural school, but brought quick results as they eagerly asked how to check the erosion on their fields.

Mr. Levi Eshkol was then Minister of Agriculture and asked me to come to Jerusalem and discuss this erosion with him. I suggested that the following day he, along with a number of others in the Department of Agriculture, should make a trip with me out in the fields so that I could show them the erosion that had taken place in the previous storm. Some twenty were in our party.

We went up to the ancient and historic Plain of Esdraelon, now called the Emek. The tops of the hills had been eroded to bare rock, little rivulets flowed downward, joining others and yet others into small gullies that joined others until down near the foot of the hills and through their rich fertile valley lands, there were ugly ravines or gullies several feet deep and several feet wide.

That noon, at lunch at the kibbutz called Ein Harod, Minister Eshkol rose and said to the group, "Until today, when I saw erosion through the eyes of Professor Lowdermilk, I did not know what erosion was or what it did, but now that I have seen it and understand it, I see these gullies now in our farm fields and feel as though they are lacerations in my own body."

From now on, the young Conservation Service was allotted more and more equipment, tractors, terracing graders, bulldozers and surveying and mapping instruments. Under the leadership of Nathan Gil as Chief, we gathered together a fine group of personnel. They were enthusiastic in their devotion to the new science and technology of soil and water conservation that is basic to increased and continuing production of abundant crops for the needs of the rapidly growing economy of Israel.

Classifying the Land

Chall: Apparently your work required education of officials as well as

Chall: the farmers and people of Israel, along with works on the land.

WCL: Yes, but they were eager and learned fast. Among our first important projects was to evaluate existing conditions of the country's lands and waters, and to reconstruct as far as possible the original landscape as to its forests, its grass and other plant cover, its soils, its climate, rains, its streams and its geology.

In making this evaluation in Israel, I drew from many sources and from close inspection of actual conditions of lands and stream beds. I found much valuable information in the Bible, in published reports of former students and archaeologists and in personal examination of "diggings" of excavations with the archaeologists Nelson Glueck, P. L. O. Guy and Sir Flinders Petrie.

We studied pioneer settlements and their land reclamation works. From this survey we could judge the damage that had been done by man and his herds and other agencies, what processes were active, and then estimate what reclamation works must be done.

So one of our first projects was to make an inventory and classification of all kinds of land of the new State, so as to formulate a program of land development for cultivated crops, for orchards and plantations, for pastures and forests, together with necessary precautions and measures and works of soil and water conservation.

This inventory was begun in 1951, the year of my arrival in the fall, and was completed in 1954. No country has a better inventory of its lands than has Israel. The country is now able to locate quite accurately those areas most suitable for irrigation, for dry farming, with supplemental irrigation, for dry farming entirely dependent on rains, for grazing and for reseeding to indigenous and introduced grasses for better pasturage.

This inventory also established possibilities of hill and mountain lands for settlement of people, where ancient terraces may be repaired or new ones built which would permit planting of vines and orchards. Lands unsuitable for agricultural uses because of severe erosion of steep, rocky slopes are designated for forest plantations wherever rainfall is sufficient.

This inventory pointed up Israel's shortage of good farm lands and the need to put a stop to further extension of cities, towns, industrial sites and subdivisions on the best farm lands. The Soil Conservation Service now passes on what lands can be used for the above purposes. Cities and towns are now placed in areas of low productivity, especially to make use of the extensive sand dunes along the coast of the Mediterranean for rapidly expanding cities of coastal plains.

WCL: All the Israeli nation has become land and conservation conscious. No longer can a farmer get a loan on his land, unless conservation measures are put in. The government of Israel is now committed to this soil conservation program, including contour farming, and will not grant development loans for new plantings of vineyards and orchards unless these are laid out and planted on the contour.

Reclamation of de-forested lands has been the most popular work for newcomers, carried out locally to give unskilled workers jobs and a love of the good earth. Some seventy million trees have been planted on formerly naked hills which now are emerald green among rocky slopes. Solution pockets in limestone hills retain the ancient fertile soils which tree roots seek out, and trees still grow today much as in ancient times.

Draining the Swamps

WCL: When pioneers began to return to their ancient homeland, the country contained many deadly malarial swamps which have now been reclaimed into splendid farm lands. Work began on the last big one, the Huleh swamp in northern Israel, shortly after our arrival, and is the crowning achievement of all such works. About sixteen thousand acres of fertile peat lands were reclaimed from swamps, and the water saved from evaporation in the swamp irrigates more land than was reclaimed.

We attended the celebration of the first plowing of these newly drained fertile peat soils in 1955. The first crops were harvested in 1956 with yields three times the average for sorghum grain and peanuts. Two and three crops a year can be grown and it is estimated that this former swamp area can feed 100,000 people. It is a veritable Garden of Eden.

Israel has entirely eradicated malaria which killed off so many of the pioneers. On our last trip, we were told that the Hadassah medical school wanted an Anopheles mosquito to show their students and not one could be found in all Israel, so students searched near the border of Syria in the north until the wind blew some across the border. Israel is now as healthful a place to live as Southern California.

F.A.O. Hires Dr. Lowdermilk to Work in Israel

Chall: You said you went out as a "dollar-a-year man, without the dollar." Then how was it that you were taken over by the United Nations Food and Agriculture Organization?

WCL: For seven months, I worked under the original contract, but there was so much to be done and so much needed in the way of equipment, and since I had many friends among the F.A.O., I kept requesting this and that assistance.

Then officials of F.A.O. said that they could do more for Israel if I was in their employ rather than as a consultant to Israel under my status at that time. So I was offered a job, with salary, to do the same work exactly, except with more assistance from F.A.O.

This was a very happy and satisfactory solution for me. It meant that instead of donating one year to Israel, I was able to stay six years in service for the country, without costing the new State one dollar in salary. This has always been a source of satisfaction to us. Thus I could do a more thorough job in helping establish conservation farming in the Holy Land and in training young men in the new Department of Agricultural Engineering, at Haifa Technion, which I was asked to establish in my second tour of duty.

Putting New Citizens to Work on the Land

Chall: It is not surprising that Israel has been so appreciative of you and your work for the country. You had an entrée to government officials as well as into the hearts of the people. What else did you do in starting soil conservation work?

WCL: At this time in Israel, there was not only the problem of saving the lands from erosion, but the problem of putting people to work. In my work, directing the soil conservation activity in the United States during the depression, we had some 110,000 boys from the C.C.C. , or Civilian Conservation Corps, working on the land. These were mostly city boys and there was need for a foreman in directing the works of each group.

I felt that we could use the same program in Israel if we

WCL: could have foremen to direct the unskilled immigrants. So Mr. Gil, Chief of the Israel Soil Conservation Service, and I went to Levi Eshkol and placed before him the project of a three months' training school course, to prepare some thirty foremen as overseers of field works. He agreed to the project and its budget and signed it.

Thirty fine young men volunteered and all entered and worked on the course with great enthusiasm. These men were promised jobs on completion of the course.

As time drew near for graduation, Mr. Gil was told that in this present austere period, there was no money to hire these foremen graduates. This would have been disastrous to morale and to the Soil Conservation Service. Mr. Gil tried every means and every avenue that might provide the funds to pay these newly trained men and without success.

Finally, I used the special status I had in the country, which I did not like to do, and ignoring the usual procedure, went directly to Mr. Eshkol, formerly the Minister of Agriculture who had now been made Minister of Finance. I explained to him the situation of money for the graduate foremen's salaries. He said there were no funds available.

I said to him, "But Mr. Minister, you approved this project and signed it." He turned to his assistant and asked if this was so and the reply was that he had agreed to it and signed it. Immediately Mr. Eshkol said, "Then we must fulfill our agreement," and ordered a check made out for ten thousand Israeli pounds to tide us over until regular appropriations could be made.

When I returned home with this good news, Nathal Gil, who had been pacing the floor and chain smoking in his anxiety, relaxed and was about the happiest man I ever remember seeing. Now our work could go forward, using more unskilled new immigrants who needed work, directed by competent trained foremen.

Chall: Who trained these foremen and where did you hold classes?

WCL: We were able to use the agricultural school's campus at Midrasha, where we had ample land to make demonstrations. I felt that it was important for us to put in an area of plots on which to use artificial rain to study erosion on various gradients and establish important data.

I had established artificial rain for my erosion plots years before, when at the University of California at Berkeley. I felt Israel must make these studies of rain storms of various intensities and duration and study the raindrop and its relation to erosion. The grounds were sloping and this enabled us to

WCL: demonstrate the advantages of contour terracing.

I taught classes on the fundamentals of erosion and ways of controlling it. The Food and Agriculture Organization had employed a soils man named Don Klaus and another named Wayne Myles, who was a former Farm Planner in the soil conservation work in the United States and who had become a specialist also in irrigation of various types. These two men, along with some well-trained men from South Africa and local specialists in certain fields, looked to me as their leader in this training program.

Henceforth, with funds to pay these newly trained foremen and the abundance of laborers, the Soil Conservation Service rapidly took on a "great leap forward."

Field Work

Chall: Did you spend much time out in the field with the Soil Conservation Service men?

WCL: Yes indeed, and I always called them "my boys." It was out in the field where we analyzed problems and decided what to do. I never said "do this," or "do that," but rather I directed their thought by questions and suggestions as we analyzed carefully and thoroughly the problems into their several factors. We let the analysis indicate what needed to be done and in this way the solution became apparent. Thus I never commanded them to do anything, but together, through analysis of the problems, we came to the right decisions.

One thing, I set a high standard for my boys in accuracy in all their work. Many times I said to them that they must be accurate in all their measures in the field, for running water never forgives a mistake or an oversight.

I continually emphasized that the hazard of erosion increased in geometrical ratio with increase in the gradient of slopes and that we must keep in mind three lines of defense against the dynamics of the falling raindrop. I discussed these in my chapter on the U.S. Soil Conservation Service.

Chall: I remember in your watershed studies at San Dimas, California, you were able to recharge a pumped-out underground water aquifer from about 460 feet back to its original eighty-five foot depth of surface water. Were you able to get the Israelis also to

Chall: recharge their over-pumped areas?

WCL: Yes, and they were very quick to catch on too, for in some places over-pumping was becoming a serious problem, especially on the coastal plain where salt water threatened trouble. Now it is like balancing a bank account. They keep track of the water pumped for irrigation and then see to it than an equivalent amount is returned to the underground aquifer in the next season's rains.

The Israelis have become excellent farmers and are eager to become better ones. I found I had to be very careful not to make suggestions until I was sure of their soundness by demonstration, for they liked to rush my suggestions into operation.

For instance, near the sea of Tiberias or Galilee, about six hundred feet below sea level, tomatoes could be grown and reach the market early at high prices. One settlement asked me to come and see if they could plant tomatoes on their steep slopes of good soils. I suggested they put in a demonstration area by using bulldozers to scoop out terraces on the hillside similar to the banquettes I described in Algeria.

It happened that this demonstration on steep slopes was very successful, but other settlements did not wait for our permission but immediately put in similar measures, supposedly because I had O.K.'ed them. Still, I would have been blamed had they failed.

Developing Water Resources

Chall: You talk about soil and water conservation, but you have not yet enlarged on what Israel has been doing in irrigation.

WCL: Well, I would say that the development of water supplies and irrigation constitutes the most significant achievement of the new State of Israel and differentiates its agriculture sharply from most areas in the surrounding Arab states. Since the time of Abraham, perhaps five thousand years ago, when there was famine in the land, agriculture there has been at the mercy of variable rainfall and droughts.

It was Israel's rapid development of irrigation that made possible the absorption of the great influx of immigrants wherein Israel doubled its population in four years and increased it two and a half times in the first ten years of its existence. Irrigation has increased yields per acre from three to six times

WCL: and more over those grown by dry farming and these yields are dependable from year to year.

With most of the water coming from deep wells, irrigation in Israel is generally done by sprinklers, rather than by furrow or border flooding. This latter requires flat land and Israel has very little of that. Israel has done extensive research in achieving the most efficient use of all her waters, for ultimately the expansion of agriculture is limited by the availability of water. Israel has much more good land for cultivation than she has waters to irrigate them, as is true also in California.

Chall: Full development of all water resources, along with conservation and use of all available lands of the country, were a part of your Jordan Valley Power and Irrigation Project, which you proposed in your book, Palestine, Land of Promise, was it not?

WCL: Yes, it was included in Part I, and it has been most gratifying to me to see all parts of the entire project being put in by Israel with the exception of those that require the cooperation of adjoining Arab states. Israel, since statehood, has become a pilot demonstration of how a poor country can about treble its population in less than twenty years and yet increase food production to keep pace with its increasing numbers--and achieve this miracle on long-neglected eroded lands, rocky hills and scanty water resources, a veritable man-made desert.

Israel has demonstrated how a people, with vision, courage, determination, and hard work, can use modern scientific methods of production, along with irrigation, fertilization and crop improvement and full use with conservation of its lands and waters, to raise the standard of living for its increasing populations to the highest level of any country in the Middle East, even without the oil resources with which the Arab states are generously endowed.

Israel, out of necessity and in her own interests, has been hammering out on the anvils of adversity solutions to problems that two-thirds of mankind must face up to sooner or later. These solutions are important to all emerging nations and lesser developed countries, seeking to industrialize their subsistence agrarian economies.

So it is not surprising that hundreds of officials and students now come to Israel to study and ask Israel's help to put in similar works in their own countries. Israel is valiantly carrying out her own Point Four Aid or Technical Assistance programs.

Dr. Lowdermilk Writes About Israel

Chall: Have you written up this story of how and why you came back to Israel and the technical details of what you did?

WCL: No and yes. I do not believe that I have written this personal rehearsal of the various things that led to my return, but I wanted to give an idea of some of the problems and satisfactions that I found in my work during these first two and a half years in Israel from 1951 to 1953, in assisting in the development of a Soil Conservation Service.

However, the technical aspects of what was done and the condition of the country in its pristine abundance as described in the Bible and Roman records, I have written up many times: the decline and deterioration that began with the invasion of nomad Arabs and their herds that destroyed the terrace walls and irrigation works, and stripped the country bare of trees and vegetation--the nomads for fuel and their herds for food. What cattle do not eat, goats will, and what goats leave, camels will eat, so the land was stripped bare each long dry summer and exposed to the dash of winter rains. So that at least three feet of soil was washed off all the hill lands of Judea and Galilee.

After thirteen centuries of this wastage and abuse, Palestine had become literally a "man-made desert" of malarial swamps, rocky denuded hills, gullied fields and menacing sand dunes along the coast.

This Jewish reclamation of this man-made desert has significance not only for Israel but for North Africa and all the Middle East which has suffered the same decline since Roman times. For Israel has become a pilot project to show how old and worn-out lands can be reclaimed and made productive to grow food and keep pace with increasing populations by hard work, courage and determination and vision, combined with modern methods of agriculture science and technology. In fact, Israel's demonstration has great significance for two-thirds of mankind today that must change over from a subsistence agrarian economy into the progress of the twentieth century.

All this I have written about over and over. I wrote first a fifty-page report on "Jewish Colonization in Palestine," submitted to Secretary Wallace and Justice Brandeis, and published in the Menorah Journal (October-December, 1940). Later, of course I wrote reports to the Ministry of Agriculture in Israel and to the Food and Agriculture headquarters in Rome, giving details of the technical works that we were undertaking.

WCL: I also gave public lectures on erosion and what to do about it in Haifa Technion at Israel's Institute of Technology and in ten weekly essays published in the Jerusalem Post and translated to certain other Hebrew papers.

Also in the United States, I had the leading article entitled "The Reclamation of a Man-Made Desert," published in the Scientific American, in March, 1960. The Atlantic of November, 1961, published my article entitled "A New Agriculture in an Old Land."

In Life Magazine, International, published in Paris for all overseas subscribers, I had an article, "There's Enough Water For Everybody," published in February, 1964. Then an article entitled "Soil and Water" was published in a British journal in 1955, also "Conservation in the Holy Land," and many other articles.

Also, I wrote chapters in several books and a five thousand word essay entitled "Israel, a Pilot Project For Total Development of Water Resources," published by Macmillan of New York, in a book of essays honoring Abba Hillel Silver's seventieth birthday, called In the Time of Harvest.

I also wrote a chapter in a book edited by Bernard Mandelbaum in honor of Israel's Bar Mitzvah, entitled "Assignment in Israel." Then of course there is my book, Palestine, Land of Promise, which I told of earlier.

Because of the above writings and many papers and lectures beyond counting, telling of conditions, works of reclamation both by Jewish pioneers and later by the new State, I have not attempted to go into the technical aspects of the work of the Soil Conservation Service in Israel, except to say that I believe it is the best and most efficient of that of any country I know of today.

As I looked out over the eroded hills, now more and more being farmed on the contour, and saw the many flood and soil saving dams in the wadies or gullies, the reservoirs for conserving water, the many soil and water conservation measures on the land, I felt that I had written my biography on the hills and in the valleys of Israel. I only helped start the work. The efficient Israelis were so quick and capable that after two and a half years, I found I had worked myself out of a job in the Soil Conservation Service.

The Lowdermilks Enjoy Living in Israel

Chall: Dr. Lowdermilk, you have not told us where you lived during these first two and a half years in Israel.

WCL: For the first six months after our arrival in 1951 we lived in Tivon, a residential hilltop development ten miles or so inland from Haifa. We lived in a duplex and found that few of our friends visiting Israel could locate us for visits. Furthermore, at that time, there were no telephones in Tivon and when I made appointments with officials in Tel Aviv or Jerusalem by letter, sometimes I found that appointments were unavoidably cancelled, but there was no way to reach me, so the long trips were useless.

After six months in Tivon, we moved to Jerusalem where Hanan and Rachelle Yarden shared their large and beautiful home with us at Matossian House. Here, we had open house each Sabbath in Jerusalem where anyone wishing to visit us for tea time was welcome.

Our guest book shows that during our two happy years in Jerusalem, something over two thousand guests had visited us, either individually or in small and large groups, touring the country from abroad. I talked to them about Israel, what we were doing and its possibilities for development.

This close proximity to government officials in Jerusalem and Tel Aviv made my appointments and work much easier and gave us a feel of the pulse of the country. We enjoyed a rich social life and made many enduring friendships.

We became close friends with President and Mrs. Ben-Zvi--the second President of Israel. Mrs. Ben-Zvi and my wife worked together on several of the youth projects. Of course, we knew Mr. and Mrs. Ben-Gurion and met them often. He invited us to a dinner he gave for Eleanor Roosevelt.

We knew the heads of the various divisions in the Ministry of Agriculture and leaders in the Jewish Agency and the Jewish National Fund that was extremely active in reclaiming new lands for the settlement of new immigrants. Living in Israel during this remarkable rejuvenation period in its long history was a thrilling and rewarding experience.

Chall: This period from 1951 to 1953 was a time of drought and great austerity and rationing of food. How did Mrs. Lowdermilk manage to do so much entertaining?

WCL: Yes, it was a most difficult time for the Israelis. But they were proud to have their own country and took all sacrifice with

WCL: very few complaints. Each person received only three or four eggs a month and only a few ounces of meat monthly, and vegetables were very scarce and there were long queues for what was available, both rationed and unrationed.

Because we were Americans and had dollars, we could ship from New York cases of dried prunes, raisins, soups, fruits, rice, cake mixes, coffee and the like, and were so happy to share these with visitors at tea or meals. Always there were plates of raisins and the excellent Israeli peanuts, toasted and salted, on the living room table to be served with coffee to everyone who came. There simply was not enough food in the country at that time and most people were undernourished.

Chall: I can see that Mrs. Lowdermilk also kept busy. What else did she do?

WCL: We had shipped our own car, but the government provided me with an excellent and devoted driver, and we traveled safely many thousands of miles all over the little country; and as elsewhere in all my travels, my wife went on field trips with me. Together we visited agricultural settlements and got acquainted with the people and their many works. While I studied the land, she studied the people.

Extraordinary Agricultural Production

Chall: How long did this extreme austerity in Israel continue?

WCL: This period was only during the first few years of the State when a severe drought was on at the same time that forty to fifty thousand new immigrants were arriving monthly and the State was swamped trying to bring new-old lands into production through modern methods.

This could not be done overnight, but in fact it was accomplished with remarkable rapidity so that Israel was soon able to supply the fast-growing population that doubled in four years, and increased two and a half times in ten years.

Before we left in 1953, Israel was producing such a surplus of certain vegetables that carrots and cabbages were being fed to milk cows in many of the agricultural settlements, and all rationing of fruits and vegetables was removed.

WCL: All Israeli farmers were required to sell their produce to the Israel "Knuva" at regulated prices, but the new State permitted its Arab citizens to sell fruits and vegetables from their village fields in stands along the highway, and the Arab villagers became prosperous fast.

No Israeli farmers were permitted to keep goats, because of their destructiveness, but again, in deference to the Arab way of life, the new State permitted Arab villagers to herd their goats on their former grazing grounds.

Chall: Has the first rapid increase in production continued through the years?

WCL: Yes, but of course production has been regulated to fill the needs of local people and of certain products that are profitable for export. A few weeks ago in San Francisco, I talked with Mr. Gvati, the present Israel Minister of Agriculture, whom I knew personally when in Israel. He said that now, Israel produces about eighty percent of all its food requirements and exports enough agricultural products to pay for all necessary food imports, such as coffee, tea, hard wheat and meat.

This remarkable record has been accomplished in only nineteen years, while the nation was still a "teenager." And this outstanding achievement was contemporaneous with defending long borders or armistice lines from Arab attacks and fighting and winning three wars against Arab neighbors who repeatedly and publicly announced their determination to destroy the nation and drive the Israeli people into the sea.

During this same time, Israel took in almost two million immigrants, most of them destitute from years in concentration camps in Europe, or deprived of all possessions when forced to leave Arab countries. Certainly the world of nations should have great admiration for this brave, courageous and industrious people, who wish only peace with their neighbors and continually express their willingness to share with them the benefits of their schools and achievements of many kinds.

Some time ago, I received a report of an investigation and study made by the United States Department of Agriculture in twenty-six of the new nations. I was not surprised to note that Israel headed the list in every category of agricultural development and in increase in production per man and per acre.

Israel's nearest neighbor, Jordan, generally ranked near the bottom of the list. The U.S. has given Jordan hundreds of millions of dollars in assistance and military equipment. Yet, at the critical time, she turned from us to support Nasser and used the millions we had given in military hardware to fight Israel,

WCL: our only friend and the only democracy in the Middle East.

Arab oil is the "loud speaker" for the Arab world, yet what they need is a better way of life for their exploited farmers and sharecroppers. Thus far, they have preferred to make Israel the scapegoat for all their internal troubles and keep their peoples on a war basis, heavily mortgaged to Russia.

In the 1968 Reader's Digest Almanac and Yearbook, the average per capita annual income of Egypt, with the richest lands on earth, is $135. The Sudan with millions of acres of peat lands to drain and farm and abundance of water has only $90 per capita. Israel's neighbor Iraq, with rich alluvial lands and irrigation waters and oil royalties, has only $193. Whereas Israel, without dictatorship and with few natural resources, has given her people an annual per capita income of $1080.

Reasons for Success in Israel

Chall: How do you account for the success that Israel has had both at home and in her work in other countries?

WCL: Well, I would say that in large part it is because the people have a mind to work. Even back in the Old Testament, when Nehemiah returned from Babylon with Jews to rebuild the torn down walls of Jerusalem, they had to work with shovels in one hand and spears in the other, because of surrounding enemy attacks. Nehemiah said, "So we rebuilt the walls of Jerusalem because the people had a mind to work."

Three thousand years later, when Jews came back to their ancient homeland, they had this same devotion and "mind to work," and do it along with defense against Arab attacks. The example and dynamic energy of the people of Israel is radiating out to other nations if they have eyes to see and ears to hear. Most African-Asian nations do, except the Arab lands which, tragically for them, have the most to gain by collaboration with Israel.

Besides hard work, there is a spirit of devotion and love of land in Israel beyond what I have found in any other country. It is not a question of economics and how much it will cost to rebuild terraces or de-stone valley lands or reseed range lands or develop irrigation or transfer water from the abundant supplies in the north to the drought-ridden fertile lands of the northern Negev. It is a question of survival and the reclamation

WCL: of the ancient homeland for which they have longed and prayed for two thousand years.

I remember seeing a small Yemenite man struggling to clear boulders from his little patch of garden. I said through an interpreter, "How does it feel to work so hard to have a little land to grow food?" His face beamed a big smile as he replied, "Oh, this is not hard work for me, for this is my land and this is my country." This spirit and devotion seems to dominate almost every Israeli.

Every boy and girl at eighteen in Israel is taken into the army--no one is rejected--but some kind of work is found for everyone so that they have the dignity of feeling their country needs their efforts.

What especially pleases me is that both boys and girls are assigned for a given period to work in agriculture of some kind out on the land. So the youth know their country and what it means in hard work to make and keep it productive.

One thing that especially interested us in Israel, as it had done in Japan, was the national program for all school children to be taken on trips to visit their national shrines, places of historic or archaeologic interest and beauty spots. The country is small enough so this can be done. Teenagers with small knapsacks hike all over the country. There is always a welcome to them to spend the night under a roof in the agricultural settlements and have free meals.

Finishing the Soil Conservation Assignment

Chall: You said you worked yourself out of a job after two and a half years as consultant in planning and organizing soil and water conservation work, for the Israelis were such efficient and eager workers. What did you do then?

WCL: Well, as you remember, I was under another assignment from F.A.O. at the request of the Israeli government, to return for another three-year term to develop a school at Israel's Institute of Technology in Haifa, to train agricultural engineers, for there was so much to be done and with sufficient trained agricultural engineers, we could do ten times as much work. But we felt that first must come a vacation which had been denied us for so long after other trips.

A Family Wedding

WCL: Our son, on technical assistance for our government in Teheran, Iran, brought his bride-to-be over to Israel, and under the greatest difficulties and red tape conceivable, we finally got them married and off on a honeymoon. The Israel government had not formulated any new policy on Christian marriages of non-citizens and without experience tried to carry out former British procedure without the facilities to do it.

But we succeeded in putting on a very beautiful wedding in the Jerusalem Y.M.C.A. that was the first Christian wedding the many friends of ours there had ever seen. In this time of austerity, invitations requested that no gifts be given.

Taking a Vacation

WCL: We stopped over in England to attend the one hundredth anniversary of Cecil Rhodes' birthday, and the fiftieth anniversary of the Rhodes Scholarship Foundation which had given me the three years of study at Oxford, England.

Speaking for Technion

WCL: When we landed by plane in New York, we found newspaper men and photographers and representatives of the American Technion Society had been waiting hours at the airport. Pictures were taken for publicity, and we found we were to begin almost at once on a nineteen-day speaking tour for the Technion fund-raising season.

The large affairs included several hundred guests at the Waldorf Astoria in New York, another in Chicago, and in Philadelphia, Houston, Texas, Milwaukee, Cleveland; and especially do we remember Detroit, for it was here that Mr. Sam Brody announced from the platform that he would donate $100,000 for a building for this new Agricultural School in Technion which I was to establish on my return to Israel.

Attending Conference on National Resources

Chall: This sounds like a heavy schedule instead of a vacation.

WCL: Yes, and that is not all. Just as the speaking tour was over, I was asked to go to Washington to a Mid-Century Conference on Natural Resources, financed by Ford Foundation. Up to this time, the policy was that dams for irrigation in the west were not justifiable financially unless the farmers so benefited could pay off the loan in thirty or forty years, or fifty, at the most; and Congress must be shown that the cost benefit ratio would be greater than 1.0 and all the better if greater than one.

I raised the question that not just the benefits to the farmers in irrigation should be considered responsible for repayment of loans, but that surveys should be made of all benefits--in rural electrification, lesser damage in floods, benefits in soil and water conservation, benefits to cities and communities and the recreation benefits from recreation areas surrounding the newly-made lakes backed up behind the dams.

This extended benefit conception has been used by Holland for many years and all help bear the costs for all share in the benefits. I also quoted Senator Hayden's experience in the Salt River Basin economic study in which all benefits were credited to the project. This study established the fact that investment of United States government in irrigation projects in the west could be economically profitable.

Lowdermilk Offered Position With the U.N.

WCL: When in New York on my return, I had gone to the United Nations and talked with Dr. Rosenberg, a Norwegian and head of the National Resources Section of the Secretariat, operating under Resolution 417 and 533 of the Economic and Social Council of the United Nations, under which all works are carried out; and also I met the second in command, a Frenchman named Father de Breuvery. These men were both at this Mid-Century Conference. They requested an interview and offered me the job of assisting to work out an over-all water policy for the United Nations.

Apparently, for some time there had been some international sessions on water policy that pointed up the fact that there was not a uniformity in methods of dealing with water problems; and that there was a lack of understanding of data to be collected and a lack of any example of integrated river basin development

WCL: that could be used as an example or a pilot project.

Chall: With your past experience in integrated river basin development this must have been a stimulating challenge.

Part I Developing the Soil Conservation Service, 1951-1953

[Taped questions and answers]

Pioneer Scientists in Agriculture

Chall: When you began to work in Israel, did you feel you were acquainted with the activities and theories of the early pioneers in agriculture?

WCL: Well, when I went to Palestine first in 1939, I knew practically nothing of what was going on in Palestine. But when I described to you my trip of that time, I told you of my visit to Dr. Chaim Weizmann, and that the Mandate had appointed Amihud Goor, Mandate Conservator of Forestry, and his brother, Assaf Goor, Chief Horticulturalist of the Mandate, both excellent men and graduates of the University of California, to conduct me on all studies.

Also you know I had been given much information by Mr. Sale, Chief Forester, and Mr. Lahav, his deputy. I found details of the water resources from Leo Picard who then and still is the noted geologist and leading authority on ground water in the Middle East.

Mr. Goldschmidt, a hydrologist who set up instruments to measure stream flow and the depth of water in wells, was helpful also, as well as Dr. Volcani, an expert on Arab agriculture.

Then I want to mention Adolph Reifenberg, who wrote The Struggle Between the Desert and the Sown, which graphically shows the Old Testament Cain and Able story and why the productive lands of ancient Palestine had become a man-made desert. Also, Dr. Rabicovich, head of the Agricultural Experiment Station at Rehovot, was very cooperative in supplying information.

Then of course, my many days spent with the archaeologists Sir Flinders Petrie, P. L. O. Guy and Dr. Nelson Glueck, gave me a splendid background for the challenge of working out on these old lands, modern soil and water conservation works.

Aaron Aaronsohn

Chall: Who do you consider was the leading early pioneer in agriculture in the country?

WCL: Someone has said, "There is a force that is mightier than the force of marching armies. It is the force of a great idea when its time to move has come." I have often pondered what inner and widespread urge moved so many of the outstanding pioneer leaders to leave their homes, particularly Russia, and move to Palestine under the exploitive and harsh Turkish rule. It is astonishing the strong leadership these men gave in preparing for the Balfour Declaration, and later for the creation of the State of Israel.

One of the most outstanding of the early pioneers to develop agriculture in the Holy Land was the Aaronsohn family, who moved out of Russia and bought land from the Arabs at Zichron Yacov, and employed many of them to work on the land to make it again productive. They had splendid relations with the neighboring Arabs in those early days.

The eldest son, Aaron, was a born genius. His brilliant mind was scientifically oriented toward botany, agronomy and horticulture. He explored Palestine on foot and on horseback, always gathering specimens and identifying the plants and species he found, and carefully filing them for future reference. These are still today the type specimens against which new varieties can be compared.

It was Aaronsohn who caused a big sensation in the world of agriculture when he discovered wild wheat in Galilee. Agronomists and plant breeders everywhere were anxious to get this wild wheat to use in crossbreeding with other strains to get a wider variety of wheat plants. This made Aaronsohn internationally famous.

He was invited to come to the United States to lecture. He accepted the invitation, though he did not know a word of English, but spoke French and German fluently, as well as Russian and Arabic.

However, he quickly surmounted this difficulty, for he learned English in one month so that he could give public lectures in the United States. Our Department of Agriculture at that time was so astonished at his knowledge of agronomy, botany and agriculture, that it made Aaronsohn a collaborator.

When Aaronsohn discovered how similar Palestine was in climate and rainfall to Southern California, he suggested that there should be an exchange of species between these two locations on opposite sides of the world. This was done, and he enthusiastically carried out exchanges to the advantage of both.

From Palm Springs, Aaronsohn took the fan palm and it thrived in Palestine as a beautiful garden and roadside decoration. In fact, during the years we lived at 25 Panorama Road, on Mt. Carmel,

WCL: Haifa, we had a row of these beside our house to shelter us from strong winds from the sea. The exchange of citrus, fruits, vegetables and plants between California and Palestine was very extensive at that time.

Aaronsohn established a large Experiment Station at Athlit, on the fertile coastal plain just below Zichron Yacov toward Haifa. The station is still there, but the lands and collections have not been maintained as when Aaronsohn was living. He had discovered in Palestine a rare variety of carob that has never been found anywhere else, which he shared with many countries. It has heavy pods with a high content of sugar. During the war this sugary pod was ground up and used as a substitute for sugar. I have eaten carob bean syrup with waffles.

Activity During World War I

Chall: Aaron Aaronsohn must have been a very exceptional man.

WCL: Indeed he was, and for that matter, the entire family of Aaron, Alexander, Sarah and Rifka as well as the parents, played an important part in the early days of the country. All are now gone except the youngest daughter, Rifka.

When war broke out between Turkey and the British, naturally these pioneers wanted the British to win. They volunteered to keep the British army and General Allenby informed on various movements of the Turkish army. No matter what surprise movements the Turks undertook, somehow General Allenby knew of it and thwarted or defeated them.

Down near the coast on the Experiment Station was a two story storehouse with a small inset high window. A British submarine cruised up and down the coast and when the Aaronsohns and their co-helpers, called the Nihli group, had information for the British, light signals were sent seaward to the submarine that could not be seen on land. This also meant that it was safe to send in a small landing party to come up a thicket ravine and make contact. Without doubt, this must have played a very important part in the victory of the British over the Turks.

However, the Aaronsohn family paid a tragic price for their courage. Of course, the Turks were frantic to locate the informants to the British that were causing their defeats. The Aaronsohn family began to be suspect. The old father was cruelly abused and soon died.

The Turks then centered their attention on Sarah, who became the martyr. The Turks were torturing her for information which she steadfastly refused to give. She realized that such torture

WCL: could not be endured too long. She begged to go to the bathroom where she knew a revolver was hidden. At once she shot herself twice, but did not die immediately and taunted her persecutors. This angered them and they then killed her. Every year since then the townspeople of Zichron Yacov go in a procession to Sarah's grave on the anniversary of her death to commemorate this courageous martyr.

Aaronsohn's Death

Chall: Where was Aaron during this time?

WCL: He was over in England and France. Of course, he did not know what was happening to the family in these last days of the war. He was now a powerful and influential political figure. He was working with Lloyd George and Clemenceau for he wanted to make the ancient Jewish homeland a place for settlement of Jews that needed to flee the frequent pogroms of that time.

Apparently Lloyd George and Clemenceau, who were planning the division of the million square miles of the falling Ottoman Empire in the Middle East, felt that Aaronsohn might be difficult to handle. He also knew too much about their politics. They could have their way better without him.

Anyway, rumor has it that Aaronsohn wanted to go to Paris in a hurry and planned to fly in one of the small open two-seater planes of that day. A friend urged him not to do so, fearing something might happen. However, Aaronsohn was in a hurry to reach Paris, and he and a pilot took off in the open plane. Aaron Aaronsohn was never heard of again, but rumor and eyewitnesses declared the pilot returned and continued flying. But no one was there to prove anything.

Chall: That was a tragic loss in Palestine.

WCL: Yes, a great loss also to the scientific world, and I might also say to the political world in the Middle East. Aaron's brother, Alexander, was an outstanding personality also, but he died years ago, and Rifka, the youngest, is the only survivor. For many years, the old home has been a shrine in which all was kept just as Aaron lived in it--his library, his specimens, his living and sleeping quarters. Hundreds of visitors come annually to see the place. They are welcomed and conducted about by Malka Samsonov, a very dynamic and hospitable personality who fascinates all tourists who come.

The Herbarium

WCL: While we were in Israel at this time, Rifka planned and constructed a very fine memorial Herbarium, with research libraries, study rooms and a lecture hall which can be opened into the patio in good weather to seat hundreds of people. But most important, all of Aaron's remarkable collection of specimens is carefully preserved and displayed.

Now thousands annually visit this memorial shrine. Among our most happy memories are the many times we stopped over, enroute to or from Tel Aviv to Haifa, to enjoy bountiful meals, warm hospitality and generous gifts from the farm or gardens.

Wild Wheat

WCL: I believe I told you that on my first trip back to Israel after retirement, I led a bus load of delegates to the 1959 International Farmer's Convention in Israel and on tour we stopped at the Herbarium. I showed specimens of wild wheat and explained that Aaron Aaronsohn had found it in Galilee. One of the wives asked me in all earnestness, "What did Aaron Aaronsohn do to the wheat to make it wild?"

Chall: Yes, I remember the story. Does the Herbarium still ship these wild wheat specimens to other parts of the world?

WCL: Yes, and each spring at just the right time, Rifka and her capable manager, Malka Samsonov, and all employees go into Galilee to gather the wild wheat. It shatters very easily and must be carefully gathered before it dries.

I meant to tell you that the Hebrew University School of Agriculture at Rehovot has named its largest building after Aaron Aaronsohn. He developed the scientific side of collecting to improve native species or introduce new species. His collaboration was a forerunner of our work, in sending out plant explorers, as for example, Fairchild, to search out and bring back species that might be beneficial to the United States.

Harding Grass

Chall: What is the story about Harding grass that you have mentioned?

WCL: Of course, Aaronsohn had found the Harding grass that remains green when other grasses have dried up and thus provides excellent grazing, so in Palestine it probably was pretty well grazed out.

During the first World War, one of the Australian soldiers

WCL: saw this hardy green grass and took some seeds back to Australia where it thrived and was extensively used in that stock and sheep grazing country.

When our American explorers for new grasses found this Harding grass in Australia they brought back seeds and introduced it into the United States, and we grew the seeds extensively in our grass nurseries for distribution across the United States.

Then when I went to Israel to help start the soil conservation work, I suggested that they send to the United States for seeds and introduce this fine Harding grass into our new five hundred acre grass nursery, to grow seeds for Israel.

The joke was on me, for we discovered we had brought the Harding grass back to its own back yard, for Aaronsohn had found it native, but pretty well grazed out. Then it had traveled to Australia, the United States and then back to its native land.

Chall: Apparently the scientists began to join forces with farmers?

WCL: Yes, and this was outstandingly so among Jewish immigrants, or those that were planning on moving to Israel. Jewish youth began taking courses in agronomy and soils. They became outstanding leaders in land classification which was a subject that went around the world. Dr. Adolph Reifenberg, a scientist of the first order, was one of the more recent of that group.

They brought in an interest in the land from a new point of view, not just the farmer's point of view. When we go into an area, we want to know the original condition: was it a forest or a savannah or grassland? When they reached Palestine, which had been so greatly modified in its landscape by past use and misuse, these scientific young men wanted to know about the soils and what they could be made to grow, for only hardy remnants remained that had endured the adverse conditions.

Chall: Not a very hospitable land.

WCL: No, exactly. These early soils men needed to gather a lot of information in order to know how to reclaim these lands, for it takes more than muscle to make such old worn-out lands productive. They had to know the soils, and the source of the soils and their characteristics and the nutrients that are inherent in the soils.

A. D. Gordon

Chall: Do you think we should discuss Mr. Gordon in the development of

Chall: the Israeli farmer?

WCL: A. D. Gordon, who came to the kibbutz Kinneret, was a deep thinker who brought with him a new concept and approach to problems of resettlement in Palestine: he maintained Jews could only redeem the land by works of their own hands. In other words, they must not use hired labor to do so important a task as the restoration of the productivity of the soil on which they must depend.

The idea was that in Palestine, Jews, even though from former white collar jobs in Europe, must actually work on the land and get hot and sweaty.

Chall: A change of direction then.

WCL: This was a fulfillment of a long-range, very important objective. This put a halo over the workman who was in the field. There were these several steps by which people's point of view was changed. You remember that at this time and before, there was the old line feudal system: landlords owned the land and the tenant had to pay an annual rental in kind.

The lord of the manor was not interested in soil, except as it produced grain and livestock. They were people with wealth and did not live on their land, but went to cities and gay places. This was an attitude which had come down through centuries of time.

Here in Israel they changed this system. and the land generally became the property of the Jewish people. This was a significant fact in making possible the reclamation of this man-made desert.

Jews in Palestine Become Farmers

Chall: You think it wouldn't have been possible with any other philosophy at that time?

WCL: No, I hardly think so. At least, this combination of intelligent effort and hard work brought a more efficient and higher standard and more rapid development.

I have said many times that never in the past has the scientist or scholar come to the aid of the farmer. Therefore, Jewish farmers have developed their own scientific traditions. I always lay stress on knowledge which farmers developed and which they pass on from father to son, which in time becomes traditional knowledge.

The life of a peasant farmer and the life that they have to

WCL: live does not appeal to modern young people, so I hold up the idea of the importance of new modern scientific farmer, as one who produces surpluses that make it possible to release a portion of the population from the growing of food for other services. It's basic in civilization. I never found many people that give as much importance to this as I do. I have discussed this in my chapter, "The Peasant Farmer," in the book Who is My Neighbor?

Chall: But Mr. Gordon's philosophy was that the farmer is the most important person and he had to do the work himself.

WCL: Yes. And it had to be intelligently done. Therefore those who work the land have to have more than just a casual interest in it. Jewish farmers were to have the ideal and interest in the soil not only for today, but for tomorrow and the generations to come that will return to this ancient fatherland.

Chall: That's probably one of the basic differences between the farmers in Israel and those in most parts of the world. They feel they are a part of history.

WCL: That's why I think we can ascribe the operation of forces like this to the remarkably rapid transformation of the Jewish settler in Palestine in building up the science of agriculture so rapidly. This scientific approach has given us also the example of what can be done with the intelligent application of scientific discoveries, and the development of research to answer questions that arise in land development and growing of crops, to keep pace with the rapid increase in population everywhere.

Sam Hamburg

Chall: While we are on the subject of A. D. Gordon and his philosophy, could we discuss Sam Hamburg and his different philosophy? When he came to Israel, about 1952, to develop large farms for growing cotton and other crops, did he run counter to the Gordon philosophy, or was Israel ready for this revision?

Changing Concepts of Agriculture

WCL: Israel, having almost tripled its population largely during these first twenty years of the State, needed to work out the most efficient agriculture for their situation. They must give close attention to mechanization in agriculture to release many other members of the country for diversified industries for export. Israel is a mosaic of many types of irregular surfaces, so that

WCL: Israel cannot carry out as large scale mechanized farming as in California with its expansive valley floors or plains.

Yes, Sam Hamburg did come in with an idea in agriculture that was at variance with the teachings of A. D. Gordon. But by this time, Israel had learned to develop her agriculture and felt a deep national love of the land; and now Israel was ready to adopt modern science and technology in large scale farming, wherever it was possible. The Israelis are mechanizing their agriculture to a very advanced stage.

The A. D. Gordon method brought about an attachment of people to the land which is the basis of a rural and social economy, whereas the Sam Hamburg method emphasizes the purely commercial interest in agriculture which tends to cause people to lose this close attachment of farmers to the land.

Louis Bromfield developed a philosophy in his books Pleasant Valley and The Farm that makes for a spiritual attachment to the land, even though mechanization is used. Also Russell Lord and David Cushman Coyle emphasized this idea. However, I know of no country with such a deep love and concern of their land as have the Israeli people.

Adolph Reifenberg

Chall: You mentioned Adolph Reifenberg. Will you tell more about him?

WCL: He was one of my very great friends, and I was delighted when he asked me to write the Introduction to his beautifully written book, The Struggle Between the Desert and the Sown. It was written in 1955. I considered him the foremost soil scientist in that part of the world. He was an expert in the classification of soils and a great scholar.

His book is expertly documented. He quotes 149 references in the bibliography from the prophet Isaiah and the Talmud, to modern men, as Picard, Nelson Glueck and Poidevard, the Jesuit. If one is interested in this problem, there is no better way to study it than to start with Reifenberg's book and then follow out the citations, many of which are very luminous in themselves.

Reifenberg was very interested in the early irrigation systems called Foggara, and explained them in great detail to me before I had an opportunity to see and investigate them myself. Picard was also an authority on these ancient methods of bringing water from a distance underground to the surface where desired. Reifenberg was also an information officer during the First

WCL: World War in the British army. He knew how to gather information and how to use it. He had been trained in England and wrote in beautiful English. I often wished I could write as well.

Chall: When you knew him, was he a professor of soils in the Hebrew University?

WCL: Yes, but he overworked and was ill; but he refused to give up his classes and died when still too young, of a heart attack.

Chaim Weizmann

Chall: What can you tell me about Chaim Weizmann? Although he wasn't an agricultural scientist, he was a most important scientist and leader.

WCL: Chaim was a scientist, and he was a humanist and a prophet. He was a marvelous personality and a genius, one of the rare individuals of our time.

Analysis of Joint Palestine Survey Commission

Chall: What do you think about the conclusions of the experts of that Survey Commission of 1928?*

WCL: They were applying ordinary business economics to the problem of reclaiming Palestine. They were concerned with the fact that the colonists hadn't sufficient markets, and they could not sell enough to give a profit that would justify, for instance, rebuilding stone wall terraces and planting orchards on the hillsides.

I pointed out to Knowles Ryerson and some others on the Commission that the ordinary kind of economics should not be applied to Palestine. For here it is the economics of survival that must prevail. When in war and your lives depend on victory, you don't try to decide whether or not it's economical. A people or nation does whatever is necessary to survive.

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*Reports of the Experts Submitted to the Joint Palestine Survey Commission, Boston, October 1, 1928.

My dear Mrs. Weizmann,

What a magnificent life you and President Weizmann have lived together! Few have had the opportunity to behold a fruition of such a life of great works and devotion to great causes.

In your grief there must be the solace of accomplishments in which you have shared great as a Scientist and great as a statesman of the world. President Weizmann stands out as a beacon of Liberty, of integrity, of Justice and faith in the destiny not only of the Jewish people, but of all manking that shines out over darkness, fear, dread and of gross injustices that beset the state of the world.

We pray that your grief may be assuaged and that the works and leadership of President Weizmann may grow in the lives of this and future generations in the redemption of Israel.

May God bless and keep you.

Sincerely, Walter C. Lowdermilk

WCL: These experts, several of whom came from California, were looking at it from their own California point of view, where there is a lot of competition in different kinds of fruits and they have the problem of shipping long distances back east. They took the whole California complex and set it down on these barren, Palestinian slopes which had been so damaged and mutilated and had lost so much soil.

I said that these Holy Lands are something different. Here your economics only establishes priorities. It doesn't establish whether or not it's justifiable. The people have to come here and live, even if it does cost more than it would if one were out in a society like California. There is no other alternative.

Chall: This was a major difference in just looking at the whole?

WCL: Exactly. Knowles Ryerson was very pessimistic in this report.

Israel Exports Food and Flowers

Chall: The Israelis created their own market really.

WCL: Yes. Markets increased with each boat load of newcomers. Also, the energetic Israelis were constantly introducing new varieties. For instance, Knowles Ryerson didn't mention mangoes, but now Israel can grow beautiful, large delicious mangoes. Dr. Oppenheimer, a prime mover in their introduction, once put a big platter of blushing mangoes in my room--he knew I liked them. Now Israel exports a fine variety of this introduced fruit, as well as avacadoes and tons of new varieties of strawberries.

There could be a long list of these new introductions into Israel for export, including gladiolas and roses which they ship to Europe by air. Of course, the mainstay of Israel's export is the citrus crop, which brings in the largest amount of foreign exchange.

Chall: Air freight wasn't present in 1928. So of course it was out of their thinking entirely.

WCL: When I went to Israel to develop the Soil Conservation Service, we didn't know very much about the soils, even though Arthur T. Strahorn had been the soil expert on this Commission and had done a soil survey; but he only surveyed those soils on the flatlands. He did not give attention to the hill lands.

But in Israel, you can't stop with the flatlands. There is such a scarcity of good level farm land in Israel that it is

WCL: necessary to make the best use of every kind of land in the country.

Israel Accepts Dr. Lowdermilk's Offer to Serve as a Consultant

Chall: Well, let's bring our discussion up to the period when you spoke to Dr. Chaim Weizmann about your concern regarding the annual winter erosion in the face of the forty to fifty thousand immigrants arriving monthly into the country. What was his reaction to your offer to work for a year without salary, just payment for expenses?

WCL: The President was very, very appreciative. He remarked, "This is a most unusual offer from a non-Jew." The government of Israel was now concerned with a life and death struggle. It was a time of drought coupled with extreme austerity in food supplies. I felt it was a privilege for me to contribute what I could to this courageous new State trying to establish themselves and reclaim these ancient Holy Lands and make them productive again.

Mr. Halpern, then Minister of Agriculture, visited me to be sure they had understood correctly that I would work for a year without salary to start a program of soil and water conservation. It seemed difficult for them to believe that I would donate my services without strings attached somewhere.

Some of the Jews from eastern Europe especially, who knew nothing of the problems of erosion, were skeptical of my motives. Everyone wanted me to explain just what this erosion was and what I planned to do to the land. Even President Weizmann asked me to his home to ask specific questions about this new feature of soil and water control.

Nathan Gil Studies Conservation in the United States

Chall: But hadn't some people been trained in the United States and so understood erosion? Didn't you tell me that Nathan Gil, who was your counterpart in Israel, came here for training? When was this?

WCL: The Mandate government had a number of good agricultural men who were in earnest about wanting to improve the land and the

WCL: production of food stuffs. They had established a number of agricultural experiment stations with very good men in charge.

Nathan Gil was one of these good men in the technical services of the Mandate government, who was sent over to the United States for special training. He had known of my visit to Palestine in 1939 and of my keen interest in Jewish restoration of the land, and he contacted me at my office in Washington where I was Assistant Chief of our Soil Conservation Service, in charge of research.

U.S. Soil Conservation Service Training Schools

WCL: I advised Gil to take the training course that we required of every technical man who entered our service. I told him that we would not employ a man simply because he had a Ph. D., but that a man must be tested out for a year in actual training and work as an assistant to one of our regular men. This gives him on-the-job training in the field of running levels and survey lines and sampling soils and driving tractors and the like.

The graduate must be able to do what is necessary in order to do a coordinated job on the land. In other words, he must be a capable "land doctor." He must diagnose the problems of erosion and drainage field by field, and decide on the best cure.

Chall: Where in the United States did you have these schools?

WCL: We had set up three schools: one at La Crosse, Wisconsin, one in Spartanburg, South Carolina, and another one in Ohio. The first two were outstanding. I explained to Gil how important I felt it would be for him to take the full year of training in one of these schools. I said that we in the States do not entrust a man to make decisions on the land, even though one had degrees and training, unless he had first demonstrated by his work as an assistant that he had the understanding and the ability to do the job. We emphasize how important it is to maintain the confidence of the farmers with whom we are working.

Gil chose the La Crosse school where he worked very conscientiously for a year. He was always very punctual. Once he drove all night in order to be at a certain place at a given time when he had promised. I chided him and told him that he was endangering his health by doing such a thing. But he never spared himself on the job.

He saw the importance of this kind of program and after his return, he sent others to the States to take this same training. That is why so much of the work in Israel is oriented towards the United States, because we shared the same training and philosophy.

WCL: Gil and these others recognized the importance of this program in the redemption of the Holy Land and gave it all they had. It was this type of discipleship that made work in Israel a success.

Meeting Again in Israel

Chall: Of course, when you and Gil had these contacts in the States, neither of you had any idea you would work together in Israel.

WCL: No, certainly not then. But when we stopped over in 1950 for three weeks enroute home from Africa when my assignment with Carnegie Corporation was completed, I knew that Gil had been appointed head of the Erosion Control Division of the Ministry of Agriculture in Israel, and Dr. Carmon was the Chief of Research in the Ministry.

Carmon and Gil conducted us on a whirlwind tour of all parts of the country. Gil was trying to get something started, but his division and budget was the smallest in the government. Officials had sufficient problems of their own and were not concerned about erosion of which they knew little or nothing.

When Israel had that heavy rainstorm while I was in the country during those three weeks and I saw again, as in 1939, the disastrous erosion, I felt that I could help Gil and these other earnest and well-trained men to do something more about it now that Israel was a State and had control of all the lands of the country.

Chall: What was Gil's reaction when he found you had offered your services to President Weizmann for a year?

WCL: He and the others were very pleased and the idea received a fine reception. They felt I could emphasize to government officials the importance of their conservation work in a degree that they themselves could not get across. We all realized we were confronted with a tremendous job to reclaim this man-made desert with its many problems, and we were all of one mind to attack the problems with all the ability we had.

It was a satisfaction to me to know that Gil would be my counterpart in this work, for I knew he had had our special training in the United States and had made excellent progress in all he undertook to do.

Developing the Soil Conservation Service in Israel

Chall: Although you had offered to stay for one year, you were there for nearly three. There must have been much work to be accomplished.

WCL: Yes. If we had stopped at the end of a year and said, "This finishes it," I know we would not have had much to show, for there was so much preliminary to getting started--such as, obtaining transportation.

I learned that you cannot do much in a year. The people with whom you work must know you and have confidence in you. One cannot come in from the outside and say, "This is what you should do."

Relationships With a Counterpart

WCL: Our F.A.O. personnel had offices with our counterparts. This was more practical and effective than the way the United States government managed its technical assistance where offices are separate. The technical expert would meet his counterpart perhaps once a week when they would plan for the coming week. There might be an occasional day or two of field work, but this arrangement was generally unsatisfactory because this prevented a close working relationship between the expert and his counterpart.

Since it is common policy for countries that are being helped to request certain assistance from the experts of technical assistance teams, it becomes a nice problem to get the country to request the assistance in a program of correlated objectives. It becomes much easier to raise the question of correlated assistance informally, that can be included in a formal request later.

Chall: Then I see--you would have to be diplomatic with your counterparts. Were you able to accomplish what you wanted?

WCL: Yes, but in Israel I had a certain advantage, because we were there when the White Paper was issued in 1939, and I had challenged the validity of its pretext that the economic absorptive capacity of Palestine had been reached.

So I was accepted as a person who was sincerely interested in the success of this adventure in resettlement of the Holy Land.

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A CHRISTIAN PIONEER IN ISRAEL

Dr. Walter C. Lowdermilk, known in this country mainly as the author of the Jordan Valley scheme, has for the past two months been serving this country as a "Dollar a Year Man" to advise us on a permanent agriculture on which to build our State.

Dr. Lowdermilk is leaving this week to attend two international conferences to which he is a delegate. In Brussels he will attend the International Union of Geodesy and Geophysics (9th Annual Assembly) and in London a conference called by Lord Boyd Orr, first Director of the United Nations Food and Agricultural Organisation. Immediately afterwards he will return to his residence at Tivon and his work in Israel.

Prior to coming to Israel, Dr. Lowdermilk had worked on President Truman's Water Resources Policy Commission and then was requested to go to Japan for four months to advise on flood problems. It was these two assignments which delayed Dr. Lowdermilk's arrival in Israel.

Dr. and Mrs. Lowdermilk have been eagerly looking forward to this year in Israel. Mrs. Lowdermilk is the daughter of a Methodist Minister and one of the outstanding non-Jewish Zionists. They hope this year of service will be their Christian contribution to the building of the new State of Israel which they feel has a great contribution to make to this part of the world, the bridge-head of democracy and progress in the Middle East.

Dr. Lowdermilk is now a consultant in the preparation of an overall plan for land-use with conservation, the first step to which is an inventory to find out the total areas of all kinds of lands of the country — how much land can be brought back to good grazing lands, how many dunams are rocky and only suitable for afforestation, how much land is suitable for the new scientific dry farming which has been developed in the dry south western parts of the United States which are similar to parts of southern Israel and how much land can be irrigated. The planned ten-year program for full use with conservation of all the lands and waters of the country cannot begin until these facts are known.

Later, Dr. Lowdermilk wants to develop a "Hagana of the Land" force, groups of men trained in all phases of land conservation for the defense of the land of Israel from soil erosion and wastage. During the depression in the United States, when Dr. Lowdermilk was Associate Chief of the Soil Conservation Service, he had many conservation camps totalling 110,000 men, working on the lands to protect and safeguard them from wastage. "Hagana of the Land" should be able to engage the employment of many workers, today directed towards road- and park building, afforestation, etc.

Dr. Lowdermilk is now advising on the establishment of a Pilot Area of 95,000 dunams in the northern Negev near Ruhamah, where all kinds of land conservation and water preservation will be demonstrated. In this area, a pioneer force of land conservators will receive practical training in these fields and in the best use of all the various types of land.

Israel is an old country the soil of which has suffered great damage since the Arab occupation. In Canaanite, Hebrew, Greek, Roman and Byzantine times, the land was protected from soil erosion by terraces. The Arab invasions gradually blotted out these conservation efforts, for theirs was a nomad economy of roving herds — cattles, camels and goats — which roamed from place to place wherever they found grazing. The animals broke down terrace walls and ate all the good grasses while the Arabs themselves cut down the trees. Over much of the hill lands, more than a meter of soil has washed off the slope, often leaving little more than rocks. However, since the skeleton rock is limestone in which there are solution pockets filled with soil which could not wash away, trees can be planted and, where rainfall is sufficient, they grow today as in ancient times as their roots seek out these soil pockets in the rocks.

Much can be done to bring back the grazing lands of the country to provide meat supplies for Israel. The ranges will have to be reseeded and protected for some time until the many unedible grasses, thorns and thistles have been crowded out by good grasses. When Dr. Lowdermilk passed through Israel a year and a half ago, he advised Nathan Gil, Chief of the Israel Soil Conservation Service, to begin a grass nursery for this purpose. Now some 150 dunams out of 2,000 dunams have been planted with superior grasses and the first few tons of locally grown seeds were harvested this year. Another need is to plant on the grazing lands good "Browse" shrubs the leaves of which the herds can eat and live on during the long dry summers. The Carob tree, which grows so well in parts of Israel, is excellent for this purpose, when kept small so that the herds can eat the leaves when the grass dries.

Dr. Lowdermilk feels that there are splendid possibilities in the Negev for meat production. During the rainy season, the so-called desert can be reconverted into good pasture land. During the long dry season, grazing should be coordinated with farming as has been successfully done in the south western part of the U.S. in the "Home Ranches". Here hay is grown on irrigated lands, fodder is stored in silos and cattle are brought in and fattened, instead of starving during the summer. There are wadis in the Negev in which diversion dams can be built and water spread for flood irrigation.

Dr. Lowdermilk is extremely satisfied with the cooperation he has received from all agencies concerned in his line of work. One handicap is the lack of foreign exchange for the four sets of heavy equipment of machinery he would like to have to speed up his work, but he is gratified that the Government has ordered at least two complete sets of equipment. Many jeeps are needed for transportation in connection with the land-use survey. None were available, nor is foreign currency available for this purpose. So Dr. Lowdermilk appealed to some of his Christian friends and has already received a donation of seven jeeps which will soon be shipped to this country.

Dr. Lowdermilk is gratified that the United Nations Food and Agricultural Organisation has sent two experts to help Israel solve some of its agricultural problems. Mr. Wayne Miles, who has had much experience in grazing and range lands in the United States and Mr. Donald Klaus, a soil scientist, also with considerable experience in the United States are working as a team along with Dr. Lowdermilk.

(For a previous article on soil conservation and restoration of grass lands cf. BD. 106/231, "Our Fertile Negev", based on a paper by Dr. Boyko. A separate article on the difficulties met by Mr. Gil, efficient Head of the Israel Soil Conservation Department, and the obstruction by the Jewish Agency to proper agricultural planning, will appear in one of our forthcoming editions. Meanwhile Mr. Goldberg, Australian rancher, has already imported the first Australian sheep to repopulate the Negev.)

Lowdermilk's Method of Work as a Consultant

WCL: My working approach in Israel, as elsewhere, was to analyze the problem and ask questions to make them see the various aspects of the problem, so as to make a sound determination of what they wanted to do and of how to do it. I rather prided myself on not telling them what specifically to do, but rather asked questions until they themselves made their own decisions.

Sometimes I drew their attention to factors that had been overlooked, and we would discuss techniques of operation and, when necessary, call in specialists to clean up certain points.

In general, I was a consultant to the Ministry of Agriculture and more specifically to Nathan Gil who now had been made Chief of the new Soil Conservation Service.

Often Gil would outline a problem to me, and I would say, "Let's go see it on the spot." I never gave a suggestion offhand in the office unless we had seen and discussed the problem beforehand. I saw to it that they really made the decisions on the basis of what we analyzed as the problems, and what we were trying to do and what we had to do it with. That proved to be just the way to work with the Israelis.

My good friend, Dov Krimgold, couldn't work this way so he had difficulty in Israel. He had been one of my research men in the Soil Conservation Service in the United States. He was an excellent, well-trained and able man. He was a Jew, interested in Israel and applied for work under F.A.O. and was appointed while I was there.

Because he was a specialist, he thought he could tell the Israelis what they could or could not do, without full explanation.

Chall: Was Krimgold successful?

WCL: No, with all his expertness, he failed. In fact, the poor man was asked to quit. Krimgold saw, after he had experienced a few fights, that he had lost his influence and prestige with the Israelis because of his arbitrary mannerisms; also, that he had lost out with F.A.O. on his special assignment with them.

To me, this was all a very unhappy experience. But I said, "Krimgold, I never tell these people what to do. I only help and encourage them to find the solution in their own way."

I only spent about a day a week at the office. Most of the time I'd be out in the field, analyzing problems with the farmers

WCL: and settlements, along with some of our own soil conservation men.

Usually, after we had discussed a problem in the field and the necessary information was gathered, we would return from time to time, not with the idea of inspection, but always in the spirit of, "How are you getting on? You've been doing well; are you getting the results you wanted?"

Problems in Achieving Success

Chall: What happened if the Soil Conservation men had what they considered to be a good plan and it was not carried out?

WCL: We occasionally had some trouble there. For example, the Lackish area had been for years used only for grazing. Some kibbutzim had been assigned land and, in the usual pattern, had about a thousand acres in each kibbutz. This is a good-sized farm, and they operated it very much as we would a farm of equal size in the United States. However, they had more personnel in Israel.

Erosion Not Understood

WCL: We had engineered our basic layout to follow the contour principle because in that way we could control storm water and prevent it from getting out of hand and cutting up the fields. I always planned our land use on the basis of my three lines of defense against erosion, which I've discussed before. When we returned, I saw that our layout hadn't been followed.

We went out in the field and here they were, plowing up and down hill. I said, "This is destructive of your fields. Your topsoil will rapidly be eroded away."

"But," they said, "we haven't time to do this contour job. We've got to put these people on the land." I could understand that problem, even though I didn't agree, so I decided that we'd have to plan farther into the future. I knew there was much land in Ruhama in the northern Negev that was of loessal soil, very fertile.

There were about 200,000 dunnams on which they had not yet located settlements. It had been Crown lands under the Mandate, and became the property of the State of Israel. I said, "Fine. We can't interfere with what you're doing on this already-settled area, but let us engineer the proper layouts on the land and take advantage of the contour before it is cut up into little farms."

WCL: This was one of the big problems, to prevent the cutting up of the land into small farms. In the United States this is also one of our big problems--to go out on land that has already been laid out into fields, usually paralleling the boundary lines. You see, we have the rectangular survey and it's very difficult to get farming done on the contour here.

In this new Negev area, we could start from scratch, and with a minimum of movement of earth, we could put in our broad-base terraces and channels and control the storm runoff, and build dams where needed to store water for supplementary irrigation and other conservation measures.

They agreed to our plan. We were dealing with Ronan Weitz who promised me they would follow through according to plan. Finally I heard that this tract of land that was going to give us an ideal setup had already been chopped up into little farms.

Here was a case where we didn't get as much done as I had hoped, nor was it as good as I had expected it to be. It was too bad that I had failed to get across to some of these early Israelis the essential features of a conservation plan. It seemed an entirely new subject to them.

Chall: Apparently there weren't any real teeth at that time in regulations that would have permitted Mr. Gil to say, "This is the way it has to be done."

WCL: No, no. The settlement people were running their own show, and the J.N.F. had not yet caught on to the basic concept of soil and water conservation measures. But now the Soil Conservation Service has authority to decide how lands can be used according to our land use capability survey.

Farming on the Terraces

WCL: Another problem in Israel agriculture was the ancient Phoenician terraces, which work well when maintained by hand labor. Israel could not use machinery on these narrow rock wall terraces, so these terraces had to be modified.

I suggested that we break down these Phoenician terraces and re-pile the stone in ridges laid out in the same pattern as our contour terraces. We usually gave them a gentle gradient of a half of one percent.

If we had to put in a channel to control storm runoff, we would locate it just below the ridge of stones. This is very important. This ridge of stones served to sieve out fine particles. The wider spaces between these stone ridges permitted

WCL: the use of tractor-drawn farm implements.

We generally had to help the farmers in clearing out the stone in the soil. Most of the soils had been so washed off, we estimated on the order of three feet or more.

We took enormous chisels, made of steel about three inches thick. Then we used two big tractors in tandem. The chisel would then go through the ground and pull the rocks up to the surface. The farmers formed ridges of rocks to outline the fields.

Such lands were usually reclaimed and devoted to orchards and vineyards. When de-stoned, the soil was generally good. Smaller stones on the surface help protect soil from rain-splash erosion.

I remember a Jewish agency settlement up in Galilee. I said to them that slopes are our most difficult problem in conserving soil under cultivation. They told me that they had put in contour measures, but I noticed they had recently put in a garden and the rows were up and down hill. We went over there and I asked "Who designed this?"

Their faces were red, for it was one of their staff who was not trained and had not been properly instructed. In other words, all measures on the land must be put in accurately by well-trained technicians. Sometimes the settlement farmers came up with some very good and sound ideas which we adopted. Whenever we found something that worked, we didn't hesitate to put it into operation.

Obtaining Rainfall Data

Chall: In helping to determine your channels and contours, did you have the kind of reliable rain data you always want?

WCL: We consulted past rainfall records. We would pick out what we called "design storms." At first in Israel we substituted records made elsewhere, because one needs a period of experimentation to find out how much water you have to expect off of this or that slope.

But in Israel, we did not have time so we had to use formulae at first that had been developed mostly in the United States where conditions were similar in climate and rainfall with the areas in Israel. However rainfall records had been kept in

WCL: Jerusalem for a hundred years, but unfortunately we needed records showing amounts and the rates of rainfall all over the country.

Chall: Did these records work out pretty well over the years?

WCL: We found they needed revision and adjustment all the time. So we set up installations to develop artificial rains on the grounds of the Midrasha Experiment Station. Then we could duplicate a design storm of heavy rainfall that actually took place according to our records.

Chall: It would seem that proper land use practices were not always easy to accomplish.

WCL: When Israelis follow conservation principles in dealing with land and water problems, they have less trouble with storm water. That is one reason why the School of Agricultural Engineering is so important because we need well-trained men in all aspects of conservation to get the work done properly. Persuasion is not sufficient. Now the big job of the school is to supply the technical engineers and kind of assistance the kibbutzim want, for this work has to be done according to hydraulic principles.

It's important for people to understand that we are dealing with geological forces. There is the geologic norm of erosion which goes on very slowly as new soil is formed. But when we remove the cover of vegetation we expose the land to accelerated erosion. It is this man-induced accelerated erosion that we are fighting. People need to understand what erosion is and what it does to the land so that they will be more willing to cooperate for its control.

Lectures

Chall: In addition to your field work, what else did you do?

WCL: I considered one of my responsibilities was to educate the people of Israel so that they would understand erosion, what it is and what it does. I talked and gave lectures over the radio and numerous public lectures in different places. I gave a series of lectures at Technion in Haifa that were open to the general public.

One of the objectives of the people of Israel is to redeem the land. Then I would ask, "What do you mean by redeeming this

WCL: land? In each rainstorm you are letting erosion wash away your productive topsoils. You are also wasting the pure rain water if it is allowed to flow off into the Mediterranean and be lost. Is this what you mean by redeeming the land?"

I was pretty outspoken, I guess, but people generally became concerned and asked for field training schools. We set up one at Midrasha to work out certain problems.

Many of the people at the school were men in charge of agriculture in the kibbutzim, or they were staff members of the kibbutzim who were responsible for certain phases of agriculture. They wanted what we called short courses, where we would give them concentrated coaching combined with a lot of field work. We would check problems with them on the ground. I remember how my old German Forstmeister would take his students out to new areas and say, "Now, what would you do on this place?"

Chall: What language did you use in your field work in Israel?

WCL: I used English. If I had known that I would be so long in Israel, we would have taken six months off and learned the language. But once I got underway with the work, then my days and evenings were taken up and there was no time.

Chall: Were there many who spoke English?

WCL: Oh yes. They were all studying English and most of the staff spoke English. This redemption of the Holy Land was the driving force that motivated everyone. That's why we could do so much, because they were working out a noble objective. I've discussed this at length in my evaluation of the Jewish Israeli farmers.

Dr. Lowdermilk Evaluates His Work in Israel

Chall: I remember your telling me once that you felt one of your important contributions was not so much in developing the Soil Conservation Service and the School of Agricultural Engineering--important as these were--but the opportunity it gave you to influence the people who made policy with respect to erosion control, who passed the laws and voted money for the work.

WCL: Most of the leaders of Israel had come from cities and of course, hadn't been acquainted with rural conditions at first. They were little aware of what I was talking about. Even as famous and

WCL: brilliant a woman as Rachelle Yarden asked me, "What is this erosion you talk about?" I invited people to come out with me into the field, to examine and see it firsthand. This is the only way one can comprehend the significance of it and how great a menace it is to agricultural production.

I've told you in the written answers how such a field trip showed Levi Eshkol the meaning of erosion, and that after seeing the gullies he considered them as lacerations in his own body. There were some twenty prominent government people along on this trip and heard him. This was quite a statement. I haven't heard anybody else say it quite so vividly.

Chall: You made your point.

WCL: Yes. And from then on the whole ministry had a new appreciation of the menace of erosion. As a result of this, we henceforth had excellent support by the ministry of agriculture, and the ministry of finance also changed their attitudes to our work.

President Weizmann was a very intelligent person, and he was a natural scientist. He was aware of this phenomenon of soil erosion and asked me many questions. A big part of my job, seemingly, was to interpret actual field conditions to the policy makers of the country, and thereby promote our work.

The Druses Advance Grape Production

Chall: Did you deal at all with any of the Arabs in Israel while you were working there?

WCL: Oh yes. They were particularly interested in developing their land, especially in cultivating and fertilizing their olive trees. Perhaps at first they were suspicious of me, but after we got out into the field, the problem became the big point of interest and the suspicion dropped away. This I found has been universally true everywhere I have been.

For example, the Druses lived in the mountains; before Israel became a State, they had only trails for donkeys and people as means of transport. But high up in their mountainous areas, they grow a very interesting long grape that is delicious and ripens late in the season, from October into January. They grow in very large clusters and ripen out of season when all other varieties are gone. They are excellent for tourist hotels and for export.

WCL: But the Druses were only able to use these fine grapes for their own food. When they tried to take them down to market, they had to go by donkey-back on narrow trails and inevitably they were bruised.

One of the first things Israel did was to widen and pave the roads to these mountain villages so that trucks could get through. Then the income of these Druse farmers rose many times over.

These mountain Druses, who are Arabs but have a religion of their own and never accepted the Moslem religion, were eager and hard-working. Most people in the United States would declare that their steep lands were not and could not be made into agricultural land. But these Druse farmers would ask our help and say to me, "We do not mind the work of making stone terraces on our slopes; we want to grow these grapes."

Our boys would work out the layout of terraces and the Druses did a good job. So I had a very generous welcome out in these Druse areas.

Mr. and Mrs. Ben-Gurion

Chall: I notice that Mrs. Ben-Gurion died last week. The Berkeley Gazette notice [January 30, 1968] says that she was a highly controversial figure in Israel, though all admired the wifely protection she gave Ben-Gurion throughout fifty years of married life. I suppose you knew her.

WCL: Yes. Mrs. Ben-Gurion was quite a character. She seemed to care very little what other people thought of her and was very outspoken.

Chall: Why? Was she impatient with other people?

WCL: Perhaps it was her personality that made her appear that way. She reflected the opinions of her husband who was and still is a controversial figure, so they were quite a combination. I met her several times, but I knew Ben-Gurion and talked with him quite a number of times. Once he sent word for me to visit him. He wanted to discuss his plan to plant up the Negev with trees. He said, "I do not like deserts." He had the old idea that trees would bring rain.

Trees in the Negev

WCL: I tried to make it clear to him that we had to have a certain amount of rainfall for trees to grow. We could not eliminate deserts by planting trees, except by irrigation, and usually what water is found in the desert is brackish.

Chall: So you gave him a little lesson on deserts, forests and rain.

WCL: Yes, but he did not back down on his idea of planting up the Negev desert with trees. But of course, the men who were responsible for carrying out this work were usually trained foresters and they did not attempt to grow trees as generally as Ben-Gurion wanted.

Chall: But they did plant trees in the Negev?

WCL: Yes, especially along the highways. They planted the eucalyptus tree which is very hardy. As you know, it can endure very dry conditions for long periods of time. The Eucalyptus is a poplar tree in arid regions. It was introduced, you know, from Australia. Along roadside ditches where water collected, they found the trees did very well, and changed the whole aspect of the landscape for the traveler.

At first, the Israelis so cherished the planted trees in their formerly barren land that they did not permit cutting. But later on, they had to in order to widen the highways. These trees furnished a lot of woody material used largely as pulp wood.

Chall: Do the Israelis have a pulp industry?

WCL: Yes, they have quite a thriving pulp industry. And they use straw for the fiber material, as well as wood.

Dr. Lowdermilk's Theories on Small Industries in Agricultural Settlements

Chall: You were telling me that you had some ideas about developing small industries in the kibbutz. What did you have in mind?

WCL: It has been my experience with farmers in trying to work out means of increasing farmer efficiency to give farmers more purchasing power that one of the most difficult problems is the

WCL: transition from a subsistence economy to an industrialized economy.

One of the big problems is how can one industrialize such a society? In discussing pilot projects, I frequently referred to possible solutions. It seems to me that the kibbutz of the various types that Israel has created offer the most ideal opportunity I have found anywhere for this changeover from a subsistence agrarian economy to an industrial economy.

Of course food must continue to be grown, but there are slack seasons between planting and harvesting. It is during these slack periods when products of small industries can be made and sold and thus increase the cash income and enable the farmer to buy other essentials or luxuries he may want.

For instance, there are numbers of beautiful examples of this in Israel. I have often thought I'd like to be able to study these in detail some time, but I'm getting too old.

Chall: Give us an idea and maybe somebody else will.

Ruhama

WCL: In the beautiful agricultural lands of the northern Negev is a kibbutz called Ruhama. Its chief pursuit is growing agricultural crops and they have a large number of workers. But as always in agriculture, there are off seasons when there is little work for all members; so the kibbutzniks decided to supplement agricultural production with the manufacture of brushes. They make brushes of all kinds and sizes for all uses, both in Israel and for export.

Chall: Where do they get their materials?

WCL: They import whatever they need that cannot be purchased locally in Israel. Sisal that is used for rope is grown nearby. For specialties such as toothbrushes, they use the most up-to-date materials and processes.

The kibbutz has a skeleton staff for the brush factory and a manager. Then when the agricultural activities call for manpower, the brush people reduce production. The skeleton group keeps the brush factory going at a lower capacity, while other members work in agriculture. When farm work is off season, the workers return to making brushes.

The efficiency might not be as great as a highly industrialized factory, yet they have done something that benefits

WCL: the whole membership of their kibbutz.

Hanita

WCL: We have a particular interest in Hanita for in 1939 we visited a group of about fifty youngsters who had set up a watchtower and stockade on the barren, rocky hills on the northern border of Palestine. During the first weeks, an attack by Arabs from across the border had killed three of the young people, in spite of the fact that they kept watch day and night from the watchtower, using a powerful revolving search light.

This was one of the most barren, desolate, isolated sites for a new kibbutz, and it was depressing to see these idealistic, enthusiastic youngsters attempting to carve out a viable home for themselves in what looked like such a hopeless situation. My wife stood for several hours up on the watchtower visiting with the armed guard while I was out with the youngsters as they picked up the stones and built up old broken down terraces on which to plant grapes and vegetables.

The J.N.F. had bought and allocated to the kibbutz some barren land in the valley below which could be reclaimed by irrigation, to grow their food. They had great dreams for the future.

But such idealism and hard work make dreams come true. The last time we saw Hanita, it was a thriving kibbutz of more than four hundred entirely self-supporting Israelis. One of their number had a relative come to the kibbutz who was an expert in making precision tools. A kibbutz industry was set up that had grown and could compete with such type of industry in England. They have all the orders they can fill.

Their forest trees grew rapidly and they built a rest house, then another, then bigger ones. All workers in Israel have a free vacation annually, and Hanita became a popular resort with its views of the Mediterranean, trails through their planted forests and good food.

This is just another of many examples of how the pioneers, by working together toward their idealistic goal, redeemed the land and made it productive, supported themselves by an industry during slack seasons that gave them purchasing power, grew an abundance of food and created assets often of as much as a million dollars for their kibbutz.

WCL: This to me is a method by which two-thirds of mankind, or more than two billion people, who are concerned with a changeover from subsistence, agricultural economy can make this change to a higher standard of living in a more or less industrialized society without the horrors of an industrial revolution.

Without some arrangement of this sort, they are idle a portion of the time. If they used this idle time, as they do in Israel, they could build up their purchasing power. The activity in this kibbutz is a social experiment in industrializing a subsistence economy. And that is one of the big problems before agriculture today, to help farmers of developing countries. This I think is one of the most important problems to be faced today. I have said many times that here in Israel they have not one experiment, but there are seven hundred, of all different kinds.

There are the kibbutzim and the moshavim and others with various modifications. This is a feature of Israel that the emerging nations should study and copy. This is where Israel's technical assistance to new nations can be of great benefit.

Chall: How did the Israelis feel about your concern for moving toward an industrialized economy through the agricultural process?

WCL: Well, they were too busy. They paid little attention to the suggestion. Everyone is absorbed in his or her task in making Israel a viable State. But the many kibbutzim with their various industries is a fascinating sociological experiment.

Part 2 Developing the School of Agricultural Engineering, 1955-1957

[Written questions and answers]

Chall: After completing your assignment at the United Nations, did you leave at once for Israel for your second assignment?

WCL: Yes, we were eager to return, for we had already been delayed for several months. My wife had rented a lovely home on Panorama Road, with beautiful views of Haifa city, bay and harbor, and the lofty Lebanon Mountains. Our house looked directly down on the magnificent golden dome and gardens of the Bahai world headquarters. This house was owned by General Orde Wingate's mother-in-law, Mrs. Patterson, of Scotland. We had already shipped out household appliances and the house was held some months for our arrival. We moved in in January, 1955.

Assignment: Organize School of Agricultural Engineering

Chall: Just what was your second assignment?

WCL: Well, my second assignment was a natural sequence to the first two and a half years as consultant in planning and organizing soil and water conservation work throughout Israel. The bottleneck in this urgently needed work was lack of trained agricultural engineers to carry out various measures in the fields and to collect and to work up basic data on actual conditions in Israel. This required technical training, accuracy and thoroughness of work.

There was also a need for trained professional agricultural engineers with full range of knowledge in mechanized farming and in farm structures, in processing of farm crops, and in agricultural settlement planning. Israel needed to train large numbers of her own youth to do this important work for the country. My assignment was therefore to organize a School of Agricultural Engineering.

It was the big ten day storm of December, 1951, that hastened the establishment of a Department of Agricultural Engineering. This storm, which should have been beneficial if the lands had been prepared to make full use of these blessings from heaven,

WCL: brought much disaster and indicated the necessity of conserving soils and rain waters if the sacred land of Israel was to be redeemed as planned.

It was here that Sidney Goldstein, then vice-president of Technion, invited me to give a series of five public lectures and illustrate, with colored slides, the hazards of uncontrolled soil erosion and loss of soils. From these lectures, and the growing work of the Soil Conservation Service, the need was recognized and preparations for this new School of Agricultural Engineering progressed rapidly.

Organizing the School

Chall: How did you go about establishing this type of school in Israel?

WCL: I had suggested before leaving in 1953, that the government of Israel request the Food and Agriculture Organization (F.A.O.) for such assistance. Dr. Philip Manson, a well-known professor of agricultural engineering, was then sent to review the situation. After several months' study, he recommended the collaboration of the Hebrew University Faculty of Agriculture, at Rehovot, and the Israel Institute of Technology at Haifa (Technion) in training men for the relatively new profession of agricultural engineering. Professor Manson's recommendations were generally followed.

Plans for developing this new Department of Agricultural Engineering included an assignment for me, by F.A.O., as visiting professor to serve as head of this new department--to organize and to develop a school at the college level, and to work out a curriculum that would integrate agriculture, hydraulics, mechanics, technology and works for Israel.

Such works would have to include adequate mechanization of farm operations for maximum production per farmer and per unit area, appropriate and efficient farm buildings and structures, and agricultural settlement layouts, irrigation and drainage, erosion and flood control, and soil and water conservation on all lands.

So complex is the subject and so great its diversity that agricultural engineering was broken down into three occupational divisions: 1, Mechanized Farming or Farm Machinery; 2, Farm Buildings and Settlement Layouts; and 3, Works in Soil and Water Conservation.

The Division of Soil and Water Conservation includes the

WCL: subject of Watershed Management, as it integrates the measures and works for several purposes within a watershed, drainage basin or other physiographical units of land development and management. These works and services all call for well trained engineers with a good understanding of agricultural crops, measures and practices that should be integrated into programs of land use and agricultural production.

The world must look more and more to this new profession to make the most of land, water resources and climate for production of foods, fats and industrial crops, to meet the enlarging demands of rapidly increasing populations. Israel has in this short time become a pilot area, for she is forced to solve problems that other countries sooner or later must face up to, as increasing populations make more demands on natural resources. What is being done in Israel has significance for the entire Middle East and for over half of the earth's inhabitants who are on the verge of stepping out of subsistence agrarian economies into industrial economies.

Thus to meet these requirements for Israel, the Technion, through this newly formed Department of Agricultural Engineering, became responsible for basic training in general science and engineering techniques, while the University's Faculty of Agricultural Engineering is a very strong one and is growing. It collaborates with government services and settlements in improving mechanized farming and in experimentation and instruction in advanced land use with conservation of soil and water.

This is an excellent example of cooperation in Israel which gives this exacting training at a cost much lower than that of a combined program in either institution.

Curriculum

WCL: Training is built up at three levels. The first level deals with the major activity of the Department: training professional agricultural engineers. We planned a four-year course of study, but this was later extended to five years.

During the first two years, the basic sciences of mathematics, chemistry, physics, geology, and biology, as a prerequisite to agricultural subjects, are taught at the Technion. At first, we thought of transferring the students to Rehovot for instruction in purely agricultural subjects; but changed, and had the Rehovot teachers come up to Technion to teach the agricultural subjects such as Soil Science, Agronomy, Horticulture, Plant Protection, Soil and Farm Management, and the like. During the fourth year, students take specialized subjects in the Division which they have selected.

WCL: To qualify for a degree as a professional agricultural engineer, the graduate must carry out, in addition to four years of study, a Graduate Project during the first year of employment, and do this to the satisfaction of his employer and to that of a Project Committee. Upon satisfactory completion of this Graduate Project, this professional agricultural engineer is qualified to carry on exacting work in his specialty.

Such graduates are in great demand--for employment by farm machinery companies, by farm implement repair shops, by agricultural institutes, and by the Soil Conservation Service. These men are also employed by drainage authorities, by cooperative settlements, by research institutes and by the Settlement Agency.

Chall: This seems a lot of preparation to become a professional agricultural engineer. What is this second level you spoke of?

WCL: The second level is concerned with postgraduate degrees of Master of Science and Doctor of Engineering Science, under supervision of the Graduate School at the Technion. This fills a two-fold need in Israel: first, the building up of a body of adequate basic data, together with scientific information; and second, in training of competent scientists to conduct research and to train others in research in engineering.

The third level of instruction is in short courses, for special students, farmers, farm managers and field technicians of settlement agencies who wish to take a three to six months course of intensive practical training in specific occupations. When these trainees have completed their courses, they return to their jobs better equipped to carry on their work.

Israel Challenges the Agricultural Engineer

WCL: Israel is a mosaic of land forms, ranging from fertile level lands to steep eroded rocky slopes, from swamps to sand dunes, from irrigated fields to dry land farms, from new forest plantations to grasslands and deserts. This new profession of agricultural engineering must continually enlarge its scope in applying engineering principles and technology to the exacting uses of all these types of land and their available waters, in response to increasing population pressures on the lands of Israel.

Besides training for progressive improvements in mechanization of farming operations and for the designing of farmsteads

WCL: and settlement layouts, the profession of agricultural engineering is expanding its scope and responsibility. It must also be responsible for the design, layout, installation and maintenance of works that are called for in upstream engineering, or in the control, conservation and use of "little waters."

These activities are included in the field of agricultural hydrology and hydraulics, a type of work which more recently has been included in watershed or catchment management. The agricultural engineer is concerned among other things, with the land phase of the hydrologic cycle.

Planning the New Buildings

WCL: I was glad to still be in Israel when along with the Technion architect, Mr. Max Loeb, we could work out together complete plans for the new agricultural engineering complex of buildings, which included a research tower sixty feet high, which would enable Israel to carry on more research on the dynamics of the raindrop than has hitherto been done.

Chall: Will you describe these new buildings?

WCL: This tower is the outstanding feature about which radiate the three principal wings. One wing is devoted to farm machinery of many kinds. Outside this building is an amphitheater for the display and study of farm equipment for tillage of land, machinery for harvesting and processing of crops. It is terraced and can seat some 250 students or farmers who come to various functions and demonstrations of the School of Agricultural Engineering. The tower and this wing have been completed. The second wing includes laboratories, lecture rooms, offices and a library, and is nearing completion.

The third wing has been designed and construction begun. This wing will include the dean's office and conference room, offices for members of the staff, for graduate students, for visiting professors, and two large laboratories. Money for this portion of the complex has been donated by Friends of Technion in the Detroit area.

Chall: How many students did you have in the school?

WCL: We had about 250 students. One-half of the students are Israeli youth studying courses in Hebrew; the other half are Afro-Asian

WCL: students, studying the same courses in English, for Israel has already become a pilot project, an example for the many Afro-Asian nations who now send representatives to study in Israel. Many nations also request that our graduates give technical assistance to their nations. The new facilities for training agricultural engineers at Technion have already strengthened Israel immeasurably, and will continue to do so in this double mission of redeeming her own lands and those of other peoples who seek her help.

Raindrop Studies

Chall: You mentioned the sixty-foot tower and the possibility of special research on the raindrop. Why is this important?

WCL: What is required in the field of soil and water may be visualized by following the work and fate of raindrops. For the land lies between the raindrop and river, and influences the disposition of rain waters in important ways. A raindrop in heavy storms usually has a diameter of between fifteen and twenty-three hundredths of an inch and reaches a terminal velocity of thirty feet per second when it strikes the ground, like a miniature projectile.

On bare soil, it explodes with comparatively great force in rainsplash, and that begins a vast mechanical work of moving soils; for two inches of rainfall in an hour will splash to and fro as much as a hundred tons of soil per acre in a level field. On a slope more is splashed downhill than uphill. This makes unabsorbed rain waters muddy with suspended soil particles that tend to seal up porous soils and increase runoff to pick up more soil in addition to that supplied by rainsplash.

As you remember, I did this kind of scientific study in measurements of soil and water runoff in China during 1922-27 and afterward, at the University of California.

But much more of this research is called for, especially in Israel. We had done some work under the Israel Soil Conservation Service in our artificial rain-making plots at Midrasha, where we duplicated storms of high intensities so as to determine safe gradients of orchard rows for different soils.

The Old and New Technion Campus

Chall: How did you manage before the new buildings were constructed?

WCL: Well, we started in an old building or two that had been knocked together, one of them a pre-fab. But these were crowded into the old Technion campus within the city of Haifa. These temporary buildings were unbearably hot in summer, without chance for air-conditioning or for breezes to blow between buildings. Then in winter, lack of heat in these sunless buildings made life miserable for the students and made it most difficult for me to lecture, and I caught flu and pneumonia.

Herman Finkel, who did the Hebrew lecturing, bore the brunt of the work during these first two or three difficult years, though I taught as many classes as I could in English. Dr. Herman Finkel had a sound concept of the place of agricultural engineering and was able to resist those who were wanting to combine agricultural engineering with civil engineering. Finkel is very keen and capable and likeable.

The students requesting admission grew rapidly and we had to spread out into some of the older buildings while we waited to move out to the new campus.

Chall: You have not told us about this new campus?

WCL: This Israel Institute of Technology, or Technion, has one of the most beautiful campus layouts to found anywhere. When we left Israel in 1953, this new campus did not exist, but some State lands, inherited from the British Mandate on the slopes of historic Mount Carmel, were designated by Ben-Gurion as the site for the new campus.

This overlooks Haifa Bay, the Lebanon Mountains, and inland up the ancient and famous plain of Esdraelon. Formerly, the Mandate government had planted some pine trees on this area that were growing well.

It has been an inspiration to watch this hillside, about one thousand feet high, partly barren, partly forested, blossom out with some thirty-five noble white buildings, all with harmonious design, constructed of Israel stone and concrete to last a millenium or more. The centuries of neglect and overgrazing has stripped Mount Carmel of its soils and left stone exposed to be quarried. Nearby and just below the campus in the plain is the large plant producing fine quality cement for local needs and for export. There is room and there are plans for many more buildings as needed on this large campus of four hundred acres.

WCL: Higher up on the slopes of Mount Carmel land has been set aside and designated for future faculty residences having spectacular views of the Mediterranean, the Lebanon Mountains and the beautiful valley below. It is gratifying to have had a little part in one section of the development of this remarkable institution of learning that will carry on into generations to come.

Relations With Students and Faculty

Chall: Will you tell of some of your associations with the students and faculty as you developed this new school?

WCL: Many of the professors of Technion were from Europe where there is an aloofness on the part of professors and quite a gulf separating professors and students. We did not want this condition to exist in the Department of Agricultural Engineering and sought to give all students who enrolled with us a feeling of solidarity and common interests.

First we had the faculty members and their wives to our home quite regularly for dinner each semester. My wife liked to give Chinese dinners, using chopsticks, at least at first, so as to break the ice and start an evening of fun together.

Then, as long as the student body was small enough, we had students to our house for a party at least once a semester. Sometimes we had them also to a Chinese dinner.

We had a large balcony, and it is a pleasure to remember them crowded together out in the moonlight, with the lights of the city below, singing songs and clapping to rhythm. When classes grew too large for our home, we had regular parties for faculty and students, with wives or sweethearts, at a campus recreation hall.

These contacts caused quite a sensation and other departments felt it was a good thing for them too. We had General Yacov Dori, President of Technion, to one of these big affairs, and he was exceedingly pleased with the fine spirit of camaraderie among faculty and students, and expressed a wish that other departments would follow our example. I understand that this fine spirit and associations together have continued during these intervening years.

Open House Atop Mount Carmel

Chall: I understand you had many other guests visiting you in Haifa?

WCL: Yes, we did. When I was requested to return for another assignment with F.A.O., my wife agreed to come only if she could live on Mount Carmel and have a view to compensate somewhat for being denied the beautiful views from our home in Berkeley, and if we would ship out the things she wanted for gracious living so that we could have guests easily.

As I told you, she heard of and made arrangements long ahead of time to rent the home of General Orde Wingate's mother-in-law, located at 25 Panorama Road, which hung over the edge of Mount Carmel about one thousand feet up. She made a very attractive home and balcony, which added space to the house when large groups came. She shipped out all the ingredients needed for refreshments which she herself prepared, having help only in serving.

Then we made it known that we would have open house every Sabbath afternoon to any and all who wished to come to visit us. Also we made welcome large groups touring Israel: Hadassah groups, some from the Jewish National Fund (J.N.F.), Christian groups of various kinds, study groups, family planning groups and the like. The Prime Minister's office sometimes called to request entertainment for some one they especially wanted to meet and talk to us.

Altogether our guest book in Haifa for those two and a half years shows that some 2,200 people passed through our home and were served refreshments, some simple and some elaborate, by my friendly wife who likes people. To all of these groups I talked about the possibilities of Israel and what was being done, and tried to open their eyes to the remarkable things going on in Israel, especially those who had come directly from Jordan and were saturated with vicious Arab propaganda against Israel.

One day, as my wife and I reminisced about our past experiences and life together in many places, we came to the unanimous decision that the all round happiest and most satisfying period of our more than forty-five years together were the years spent in Haifa at Technion.

The Sinai Campaign

Chall: What were you doing in Israel when the Sinai campaign began?

WCL: Actually, we were on a picnic up along the Israel, Lebanon and Syrian borders. It was beautiful spring weather. The wild flowers were out while the sun gleamed snow white at us from the Mount Hermon massif, ten thousand feet high.

From our picnic site on a wild flower bedecked Israel hillside, we looked down on the Huleh Basin, which is a physiographic gem. Since geologic times, this magnificent valley had been a papyrus swamp, infested with malaria and wild boar. This is the most northerly of the great papyrus swamps from which Egypt made paper. The largest in the world is in the Sudan.

Peace and Quiet on Lake Huleh

WCL: The picnic party consisted of two autos of the highest officials in the Bahai world headquarters, located in Haifa, Israel, my wife and myself, along with our driver. I wanted to show them how Israel was completing the drainage of this area prior to the first plowing that was shortly to take place in certain drained areas.

After our picnic lunch we drove along the Lebanon border where all was peaceful and we took pictures of Lebanese farmers working on one side of this border road and Israeli farmers on this side.

Then our road took us down hairpin turns with magnificent views to the drainage headquarters where my good friend, Mr. Boaz, was awaiting us with a boat in readiness. This was one of the most delightful boat rides any of us had ever experienced. We glided along in recently made canals between swaying tall papyrus, while turtles and native wild life, including countless birds, hurried away from our noisy engine.

We went to see the outlet to Lake Huleh that had been enlarged to drain the swamp and carry winter flood waters down into the Jordan River.

We crossed over to the Syrian side of the Huleh swamp and lake. We looked up on the hillside at the Syrian villages and fortifications that periodically shot down on Israeli farmers or dredgers at work and commented on how convenient this was for the

WCL: Syrians to attack Israel and how difficult it would be for Israel to retaliate at such advantageous Syrian military installations. But all was peaceful.

Suddenly a speed boat swept down upon us and the boatman spoke hurriedly and quietly to our boatman in Hebrew which none of us heard or understood. We noted however that at once we turned away from the Syrian side and returned to boat headquarters and shortly we started back to Haifa. There was very little traffic and at 5:30 we arrived home, happy and tired.

Notified of War

WCL: The phone was ringing as we unlocked the door. The news was startling--the United States Embassy was notifying us that all American citizens must leave at once, that only two hours notice was allowed for preparations. I was employed by the United Nations, so I was not forced to leave, but my wife was told she must be down at the airport--two hours away--by 9 P.M. for a plane to fly her out along with others. "But why?" we asked. Then it was explained that Israel and Egypt were at war and all Americans must leave.

This Inez absolutely refused to do. Only if I went would she leave and she felt no need for either of us to go. She had been through a number of wars in China and was not afraid. Also we felt that the Israelis would give a good account of themselves and the war would not reach Haifa.

So we stayed in our comfortable home and invited those next day who were leaving by boat to congregate on our balcony and enjoy cold fruit drinks, angel food cake and homemade marshmallows while waiting until near departure time for the boat.

As these deeply concerned and frustrated wives saw the calm and comfort of our home in which we were remaining, we heard them whispering to their husbands that if Mrs. Lowdermilk was staying, why couldn't they remain too.

Chall: I imagine the American Embassy officials were not too happy about Mrs. Lowdermilk's decision not to go when ordered to?

WCL: No, they were not. And I had to sign a paper that in case of serious trouble, we would not ask any special favors for evacuation, even though I was with the United Nations.

This decision certainly saved my wife endless trouble. For in this hurried evacuation of all State Department and Technical

WCL: Assistance personnel, the baggage got mixed and refugees going to Athens had their luggage, which was limited to only two suitcases, go to Rome while much luggage for Rome went to Athens. It was some days before some of the evacuees had any luggage at all and great was their inconvenience and grumbling.

Evidence of War

Chall: Did you see much evidence of the war at the south?

WCL: Indeed, and this was an experience we shall never forget. It was most inspiring to see the discipline of this little country under war conditions. Reserves were quietly called up and everyone knew exactly where to go and what to do. This included our driver, Joe Peretz. There was no complaint from anyone about any inconvenience that we ever heard.

From our balcony a thousand feet up on Mount Carmel, we looked down upon the parade grounds, and there we watched being gathered, every type of conveyance owned by the Israelis--motorcycles, passenger cars, trucks of all kinds, including gasoline and milk trucks, in fact, everything on wheels. The army which swept the Egyptians before it moved on whatever transport Israel possessed. It had few regular army trucks.

Either that night or the next, an Egyptian destroyer attempted to bomb Haifa harbor. The Egyptian radio was announcing that Haifa was in flames. It was in the early evening and we stood out on our balcony to watch the battle, and later, as the Israelis drove the ship further out into the Mediterranean, I went to our rooftop to watch the battle. Yes, many Egyptian shells were fired, but all went far off course and none hit their mark and no damage was done.

The Egyptian radio told of how courageously her brave men fought and that Haifa was in flames and then the sailors had had to scuttle their destroyer and all died gloriously. The next morning, a group of us sat on our balcony drinking coffee while we watched the Israelis tow the Egyptian destroyer and put it into the dry dock below us.

Within less than a week, it was out in the Mediterranean with Israeli officers and men aboard while the Israel radio invited Egypt to send up more destroyers for Israel's use.

The following evening, there was an air raid warning. Again it was exciting to see the discipline of this little country to do what it had been told to do. Instead of rushing to our basement

WCL: as ordered, we stood out on our balcony. Immediately, all the thousands of lights in Haifa below us went out as though from one switch. Auto lights too went out. Immediately the city was totally dark--there seemed not one light anywhere except far up the valley, the flames still burst forth from the high chimney of the oil refinery.

There was a big black cloud overhead. We heard the drone of planes above us, but no bombs fell. We doubted there were actually enemy planes and wondered if perhaps Israel was doing this herself to test out the reaction of her citizens. The compliance had been perfect.

Reactions to U.S. Position

Chall: Then this was all the evidence of war that you saw?

WCL: Yes, but, like the six-day war last year, it was all over before we could fully grasp that the country was at war. In my opinion, time has proved that the United States made a big mistake by demanding of Israel a cease-fire and immediate retreat from Sinai, where she would have had the Suez Canal in a few more hours of fighting, along with England and France, and they would have returned it to the original Suez company from which Nassar had confiscated it. Furthermore, the Egyptians would have known they were defeated.

But Israel had to give in to the terrific pressure from the United States. Eisenhower made it clear that he meant business. All U.S. citizens were evacuated, we threatened to cut off all food supplies from America, as well as cut off all transfer of money, and unless Israel's compliance was immediate, we would impose a total boycott.

Israel was not permitted time to remove captured booty from Sinai of vast stores of military equipment, and medicines and equipment in an underground hospital with several hundred beds that had been provided for Russian volunteers that were to be flown in. For Egypt was to be victorious in this next round to annihilate Israel that was being prepared for, assisted by Russia, even back in 1956.

Chall: Was there resentment among the Israelis because of this demand for their victorious army to immediately retreat from a totally defeated army?

WCL: Well, I confess, it was entirely un-understandable. Israel was a democracy, she was our only real friend of the free world in

WCL: the Middle East. America was supposed to be her best friend. Now America had made Nasser a victor to his people and he was declaring over the radio that America saw the justice of his cause and so the United States had repudiated Israel's aggression.

A large monument was put up in Sinai and this Sinai victory has since been an annual celebration in Egypt. The Egyptian people were never allowed to know that Israel had defeated them.

Chall: Why do you think the United States reacted this way?

WCL: Of course, we do not know the inner workings of our State Department. But oil has always been the "loud speaker" for the Arabs, and no one wants to interrupt the loud speaker. Furthermore, this seemed to be an opportunity for the United States to demonstrate that she did not approve of wars: by thus slapping down so-called aggressors who were our close friends, America would convince the Arabs that we were their friends and came to their aid because they were being attacked, not only by Israel on land, but by French and England by air and sea.

So we caused the failure of the entire campaign that would have made the Suez open to all nations all these years under the original Suez company. But all this conniving to save Nasser does not appear to have gained us his friendship, for in the six-day war, to save himself, he announced to the world that it was not Israeli planes that had defeated the Egyptians, but planes from our destroyers in the Mediterranean, so that all Arab countries drove out the Americans. Our son and his family were driven out of Khartoum, the Sudan, and attempts were made to destroy our buildings, as in other Arab countries.

Prisoners of War

Chall: If Israel had to withdraw so quickly at Sinai in 1956, I presume they did not take great numbers of Egyptian prisoners as during the six-day war?

WCL: Oh yes. They brought back about five thousand, largely officers, and put them in the big army enclosure formerly used by the British, near Haifa at Athlit.

Israelis are very poor propagandists. We wished that Israel had called on Life Magazine to send a photographer and writer and entitle it "Life Goes to a P.O.W. Camp in Israel." The treatment given the Egyptian prisoners of war by the Israelis was astonishing.

WCL: Hundreds were entertained in the homes of faculty members. All the faculty in Technion were doing this, and my wife wanted to join in, but we were not permitted because we were with the United Nations. If officers were interested in medicine or nursing or hospitals, they were taken to such places in Israel on inspection tours; if interested in education, to various Israel city schools and universities to see what Israel was doing. Engineers were taken to places that might interest them.

No policemen and no guards went along. All was on an honor basis, and there was not an instance of an attempt to escape. Finally, they were returned to Egypt with such memories of good treatment that we were told Nasser refused to allow them to return to their homes until they had a six months period of brain washing in a desert camp.

Background of the War

Chall: Were you aware in Israel of the tensions between Israelis and Arab terrorists which caused Israel's decision to collaborate with the British and French campaign against Egypt?

WCL: Oh yes, decidedly so. There was scarcely a day without some attack by Arab fedaheen against Israeli citizens. When we were in Jerusalem, one night just outside our window, an Arab terrorist shot and killed three unarmed night watchmen at an apartment house under construction, as they sat around a little campfire to keep warm. We heard them dying.

An Israeli in an adjoining apartment dialed the police in the darkness for none of us dared turn on a light for fear of being shot at. The police came in about three minutes and chased the Arab terrorist a few blocks away into Jordan where he escaped over the border.

Such things were a common occurrence, but although Israel was continually complaining to the United Nations, she got nowhere. More than six hundred Israeli citizens had thus been killed before Israel finally, in desperation, felt she must attack Egypt, which was the source of this trouble and who Israel knew was planning in Sinai another attempt to destroy her.

Israel knew that runways, military stores and an underground hospital I mentioned, supplied with the latest medicines, were prepared for the Russian volunteers that were to be flown in shortly when Egypt was to attack Israel.

What nation would continue to stand idly by, after all

WCL: attempts at negotiation failed, and allow more than six hundred of her citizens to be killed without doing her utmost to stop such terrorisms?

Leaving Israel: Retiring

Chall: When was your assignment under F.A.O. at Technion completed?

WCL: I guess I could have continued on if I had wished, for the government and Technion officials requested that I do so. But as you remember, I had retired from the United States Department of Agriculture the day of my sixtieth birthday.

Now I had completed exactly ten years of interesting and fascinating experiences in my international work in Africa and in Israel. I felt it was time to retire a second time and decided to do so officially on my seventieth birthday.

There were numerous farewell parties given by students and faculty in Technion, by the Soil Conservation Service, by former colleagues with whom I had kept in close contact, by our many friends throughout Israel, and by officials in Jerusalem, including a farewell luncheon given by President and Mrs. Ben-Zvi.

We did not feel that we were saying goodbye to this land that we felt had done more for us than we had been able to do for her, for we knew in our hearts that we would come back to see the progress that was taking place. Changes were so rapid, and we wanted to keep up with Israel and all that was going on in this exciting country.

A large delegation of friends gathered at the airport at Lydda to see us off to the United States. We planned a stopover in Rome to report to the Food and Agriculture Organization headquarters. The unexpected delay there and new assignment is another story.

5-17-57 | Haifa - Israel 5053.

5057 Sabbath Meditations on our Balcony in our Haifa House.

What a blessing Moses rendered humanity when he proclaimed this Seventh Day for complete rest. Israel keeps this Commandment more strictly than any other nation I know. I thoroughly enjoy it.

To day is my last Sabboth in Israel before my retirement and emeritous status and my 70th Birthday.

Again I visualize the terrible erosion of this Holy Land as I first it in 1939 and the human erosion of the people, who with their herds had brought to the Holy Earth such destruction and had created here a man-made desert.

To day as I think of my last trip around the country, I felt as if I had written my autobiography in the valleys and on the hills of Israel as I saw the many measures of conservation such as countless miles of contour terraces, grassed water ways, check dams to hold storm run-off in great numbers large and small reservoirs and other water saving devices applied

Who in their eagerness in two and a half years have given Israel the best Soil Conservation Service of any country I know. And now with the new Agricultural Engineering Building and its faculty turning out trained "Land Doctors", Israel can do many times as much work on the land.

Israel is already a Pilot Project for two thirds of mankind, who must change over from subsistence agriculture economics to modern ways if they are to give their peoples a more abundant life.

Israeli realize that there is much to do to prepare the Good Earth to support present and future generations. In a larger sense everyone is a farmer for the Stewardship of the Holy Earth is given to the Human Race.

When one gets out on the land as I do and works with farmers, there is some sort of a common denominator. When one works with soils as they relate to welfare of humanity, one talks a common language.

Love of land and determination of these people to redeem the land has made Israel an example for emmerging nations.

Pages from Dr. Lowdermilk's diary. Each of the more than 7000 pages is dated and numbered.

Part 2 Developing the School of Agricultural Engineering, 1955-1957

[Taped questions and answers]

Developing Program and Course of Study for the New School

Chall: I want to talk to you today about your activities in Israel when you were setting up the School of Agricultural Engineering. Was this a new challenge to you?

WCL: Yes, it was very much of a challenge. I had been assigned by F.A.O., at the request of the government of Israel to work out a program of soil and water conservation and to select and train a staff to carry it out. This I had completed.

Now they were in a position to do ten times as much work if they had trained agricultural engineers. I emphasized the fact that we needed to train our own men because Israel could not afford to employ specialists from other countries for a number of reasons. But in order to perpetuate the soil and water conservation work we had to train the staff of agricultural engineers to do a good coordinated job throughout the country.

Dr. Goldstein was vice-president of Technion at the time. I discussed with him and the staff in conferences the need for an agricultural engineering training school and suggested that Israel ask F.A.O. for assistance in working one out. They sent Professor Manson who spent several months in Israel looking over the situation. We had many consultations.

Of course, I wanted to see that we worked out the most up-to-date aspects of agricultural engineering. Professor Manson felt that Israel did not have the financial resources to follow the practice we usually do in the United States, where in our land grant colleges, there is a department of mechanical as well as agricultural engineering.

The Hebrew University had no agricultural engineering courses, and Technion, Israel's Institute of Technology, had no agricultural school. So Manson suggested that instead of trying to put in a department of engineering at the Hebrew University, or to put a department of agriculture in the Technion, which was an engineering institute, that the two institutions should

WCL: collaborate and save greatly on personnel and costs.

Cooperation was worked out by the two staffs in Israel. At that time, I left for a year to work for the U.N. in New York. I kept in touch with developments. But the first experimentation with this type of collaboration was worked out by Dr. Herman Finkel, who had been appointed head of the Department of Agricultural Engineering.

Chall: Oh, I see. They were working out some of the difficulties while you were away.

WCL: Yes, but Dr. Finkel did a fine job in working out a satisfactory collaboration.

The Faculty

Chall: Did your various faculty members have difficulty in integrating their philosophies when coming from different countries of Europe and South Africa?

WCL: Well, the soil conservationist, Dr. Finkel, was the administrator. For action works out in the fields, the soil conservationists took charge and coordinated the specialists and their work. All the various professors from time to time took their students out into the field for practical instruction.

This helped to wipe out any differences that might otherwise have built up among prima donnas exclusively doing teaching work. Agricultural engineering is a combination of the theoretical and the practical and its success depends upon its effectiveness in getting the job done.

The life of the nation was at stake. Their determination to redeem this land pervaded all operations. That is why we were able to do so much, in my opinion, and why we all got so much satisfaction out of what we did.

Chall: Were you able to bring other people into Israel at the beginning to teach in the School of Agricultural Engineering?

WCL: Yes, a few people who had had experience. There was one excellent Jewish engineer from South Africa. His name has slipped my mind at this moment.

WCL: We sought and received as much aid from F.A.O. as possible. Whenever we had a need on our staff for an outside expert, we would appeal, after receiving approval from the Israel government, to F.A.O. for such personnel.

One of these experts sent out by F.A.O. was an able specialist in farm machinery named Elema, with whom I still correspond. He got out with the Israelis in the field and worked with them and gave a tremendous contribution. He is now a recognized outstanding leader in central Europe, in farm machinery.

All the ten or so F.A.O. specialists sent to us were fine dedicated men, and it would have been impossible to do the job we did without their assistance.

Our teaching staff pretty much followed standard procedure, except we had to give attention to certain problems not found in other countries. For instance, stony land, in the United States, would be classified as suited only for pasture or forest. In Israel, we often had to convert such land into orchards or vineyards. When these lands are properly laid out, they could be irrigated with sprinklers, even on sloping irregular lands.

Designing the Buildings

Chall: You had quite a responsibility in working with the architect to plan the buildings, didn't you?

WCL: Yes, but my first task was to build up a department of agricultural engineering and to choose its faculty and work out its courses of instruction. At first, we had to be crowded into temporary quarters with inadequate facilities so we were in desperate need of new buildings.

We secured a Technion architect named Mr. Max Loeb, who soon caught on to the needs of our department as different from the needs of other departments, and looked at the problems from our point of view, and was most helpful.

I called in the entire staff and asked each division to set down what they would want to have in their division and how it could be integrated with other divisions of the department. We set up regular meeting times for the discussion of our building plans and new developments.

WCL: We wanted to develop the plans for a building that would last for a thousand years here and that would meet the needs of a growing country for the modern day.

Chall: Exciting kind of project, isn't it?

WCL: Yes. I said that we are not going to be limited by the needs of today, we are looking forward to the future. And those plans for the future must also include such needs as you have today. So that we will be prepared to meet the requirements of agricultural engineering for a modern nation for today and tomorrow.

Our buildings were carefully designed to make good use of our hillside topography. We had models built for a research tower and three wings. Then we photographed these from different positions that we used to illustrate the building for our prospective donors.

Value of the School to the Developing Countries

Chall: Would you consider this School of Agricultural Engineering one of the top schools of its kind in the world today?

WCL: Yes, I would. We have an excellent staff for undergraduate and graduate studies. The Afro-Asian countries prefer to send their students to this school above all other schools. We found them from Formosa, the Philippines, India, Burma, Southeast Asia, as well as African nations. The last year there were as many Afro-Asian students as there were Israeli students.

These nations recognize they need this training and UNESCO has set up fellowships, to show their intention to train graduate agricultural engineers as doctors of science at Technion and to indicate that UNESCO has chosen this school for graduate study for students from other schools who wish graduate degrees.

Dr. Nathan Buras

Chall: Is Dr. Nathan Buras still the Dean of the Lowdermilk School of



Nathan Buras, Dean of the Lowdermilk Department of Agricultural Engineering. Portrait of Walter C. Lowdermilk in the background. 1968.

Chall: Agricultural Engineering?

WCL: Yes, he has been the Dean for the past four years or more. He is a brilliant student of much ability. He got his Ph. D. from the University of California at Los Angeles. Both the University at Berkeley and at Los Angeles were eager to have him on their faculties and offered him splendid inducements.

I was exceedingly proud and grateful when he turned down these offers and returned to give his talents and contributions to Technion. He is well trained in mathematics and the use of computers. He is a specialist in agricultural hydrology and is internationally recognized as an authority.

Chall: He developed some of those techniques and theories that Mr. Samuel Mandel wrote about in International Science and Technology, June, 1967, on "Underground Water" that we looked at the other day?

WCL: Yes, and Nathan Buras himself has written some very important papers and made quite a name for himself among agricultural education people. There was a large scientific congress in Switzerland dealing with water problems. Papers had to be sent in advance. Nathan Buras wrote one on ways to determine by computer how much water should be extracted from the ground in consideration of what is in surface reservoirs. I am not sure of the title.

The congress opened with greetings and at once three men were called to the platform, one of them Dr. Nathan Buras. The chairman of the congress said that three papers were so outstanding that they wished to give the authors special citations. Thus Buras, along with the other two, received a citation and a magnificent gold Swiss watch.

Buras has done a splendid work in building up graduate studies. For, as I have said many times, one of the great needs of Israel is the building up of basic data for scientific studies and experimentation; also, the need for building up trained scientists for the conduct of scientific research and also for teaching others in the conduct of scientific investigations.

I look for this agricultural engineering school to become the leading center in the entire Middle East which will become recognized both for its eminence in research, instruction and for graduate study.

Part 3 Three Return Visits to Israel, 1959, 1960, 1964

[Written questions and answers]

Chall: When you left Israel in mid-1957, did you expect to return for visits from time to time?

WCL: Yes, of course I hoped to watch the progress. I wanted to see how "my boys" and their works in soil and water conservation were developing, as well as the development of the Jordan water scheme which I had first suggested in 1939 and published in my book, Palestine, Land of Promise, and I wanted to visit the new agricultural engineering school which I had helped establish at Haifa Technion.

International Farmer's Conference, 1959

Chall: How long did you wait for your first return visit?

WCL: The Israel government, as part of the Tenth Anniversary Celebration of the State of Israel, invited farmers of all friendly nations to come to Israel for a month, to a first International Farmer's Convention to begin April 5, 1959. This was to be a sort of a "coming out party," to show other nations how Israel had reclaimed her "man-made deserts" and had increased food production to keep pace with her rapidly increasing population.

I was asked to make arrangements and provide publicity to arouse interest and attendance of farmers in the United States. So for some months beforehand, I was kept very busy with much correspondence. The first of April found our delegation of farmers on planes enroute to Israel, to join with the Israelis and some five hundred guests from thirty-two countries.

Chall: Well, this seems to have been quite an historic event for farmers.

WCL: Indeed it was. While much emphasis was laid on "dirt farmers," some nations sent their Ministers of Agriculture or top officials concerned with increasing production of foods and fibers for the economies of their nations.

Much work had gone into preparations. Before field trips began, an entire week was spent in Jerusalem. During morning

WCL: and evening sessions, papers were given and discussions were held on the beautiful new campus of the Hebrew University on the outskirts of Jerusalem. During early afternoons, tours were made to various places in and around Jerusalem.

The opening session was quite a spectacle. It was held in the partially completed Jerusalem Convention Center with fifteen hundred people filling every seat in the huge auditorium. The program was excellent--though all complained that it was too long, lasting until after 1 A.M., because all welcoming speeches were first made in Hebrew, which none of the guests understood, and then completely translated into English. This error was later remedied. Henceforth, speeches were in English, followed by short translations for the Hebrew-speaking audience, which was small, because most understood English.

Chall: Did you deliver a paper before the delegates?

WCL: Yes. Mine was among the first and was entitled "Conservation, a World Problem," and was given before a packed audience in the Hebrew University campus auditorium. The Conference kept voluminous copies of all proceedings which were given to all delegates. Later a bound copy of some four hundred pages was sent to each delegate.

This volume is entitled International Farmer's Convention in Israel, 1959. These are available. They were presented as a gift--a token of a successful international event--by A. Ben-David, the Assistant Director General of Agriculture, and printed by the Government Press in Jerusalem.

During this first week there were the General Sessions, including a Symposium for Agronomists, and a Seminar on Land Settlement, and what was considered an exceptionally outstanding Symposium for Veterinarians, in which the U.N. Food and Agriculture Organization added much information.

During this week there were interesting teas and receptions where delegates met socially and got acquainted. We were all interested in the colorful native costumes of delegates from the countries of Africa.

Large buses picked up delegates from their various hotels in Jerusalem for tours that lasted several days each and covered much of Israel. It was a big undertaking for Israel to plan ahead for meals and hotel reservations, so generally we were divided into groups of only two or three buses for each tour.

Chall: I presume this helped the various nationals get better acquainted?

WCL: Yes. We often had very jolly times with our groups and on each

WCL: tour, our groups were rotated, so we became acquainted with many delegates.

One novel and successful scheme was carried out. After the general sessions and official tours were over, all delegates who had the time, and this included about two hundred from abroad, were invited as guests into the homes of Israel farmers who represented all types of agricultural settlements--collectives, cooperatives and private farms. Staying on the farm, as one of the family, enabled guests to come into direct contact with farming and village life in Israel.

Chall: What was the general attitude of the delegates?

WCL: Splendid. The land and what it can be made to produce is a wonderful common denominator to bring farmers of the world together. Politicians may wrangle and have diverse views, but if farmers of the world were permitted to meet and work together, they would create a new world of production of food for all and a new appreciation and love of the Good Earth.

There is no place in the world I know of that shows so clearly what vision, hard work and determination, combined with modern science and technology, can do to increase production on long neglected or difficult lands, like the State of Israel. An Indian delegate said he learned much more in Israel that he could take back that would be beneficial to his villages in India than he had in his year of study in the United States.

For, he said, Americans spend so many millions of dollars doing things in a big way, whereas he could see how Israel had taken lands, as bad or worse than any in his country, and with hard work, determination and technology in applying modern scientific methods, made such lands increase production to keep pace with their rapidly exploding population. This seems to be the main problem for most nations of the world today.

Chall: How would you summarize this first International Convention of Farmers?

WCL: I feel that it is best summarized by Mr. A. Amir, Deputy Director of the Israel Ministry of Agriculture, who said, at the closing session:

> This conference has turned out well. We have listened to comprehensive accounts of the state of agriculture in many parts of the world; in the countries of Europe with their high degree of productivity, the new states of Africa on the threshold of advancement, and the lands of South America, tackling diverse technical and social problems. We came to realize that the problems besetting

agriculture are fundamentally similar, and that everywhere farmers are up against forces that are beyond their control. Yet we saw that difficulties can be overcome with the aid of science and organization, and the farming community is able to turn want into plenty. We should beware, however; from the creation of plenty it is only a short step to surpluses and falling prices. And here, governments have a heavy responsibility, for a country will only prosper if its economy is firmly based on a thriving agriculture.

Through our labors and with the help of international organizations we have achieved much in Israel and are now able to contribute to the advancement of other, less developed countries. We extend our hospitality to whoever is interested in our work in the field of agriculture, and wishes to learn from our achievements. To our mind, international cooperation on such a basis is the guarantee for a fair standard of living in the world, which in turn provides the best assurance for peace.

Special Activities for Dr. Lowdermilk

Chall: Did you have other activities on this trip besides the Farmer's Convention?

WCL: Yes, two that I shall never forget--one a very unpleasant one when I had my fifth bout with pneumonia that kept me in the hospital some time. During the crisis, the Israel radio issued three bulletins daily on my condition and even President Ben-Zvi in person phoned to my doctor.

After the hospital, my recovery was rapid in the warm and generous hospitality of Rifka Aaronsohn at the beautiful and historic Aaronsohn Herbarium, at Zichron Yacov, that honors the memory of her famous brother Aaron.

My rapid recovery, I must say, was also due in large part to Malka Samsonov, whose good cheer, good nursing and excellent food which she served to guests at the Herbarium, were my daily tonic.

Before my illness, I led a bus load of delegates to see this famous herbarium. I had talked at length on some of the discoveries of Aaron Aaronsohn and laid special emphasis on his discovery of "wild wheat" in Galilee that had caused quite a stir among agronomists the world over. When I had finished,

WCL: as I told you before, the wife of one of the delegates in all earnestness asked me, "Please tell me what Aaron Aaronsohn did to the wheat to make it wild?"

School of Agricultural Engineering Named After Dr. Lowdermilk

Chall: What was the other unforgettable incident?

WCL: Well, it was the beautiful highlight of the entire trip. The Technion had invited about 150 of the Technion faculty and our personal friends to a reception in our honor at the newly completed Aeronautics Building on the new campus on historic Mount Carmel. Several speeches were made and it was publicly announced that henceforth, the official name of the agricultural engineering school, which I had helped develop during the last three years before my retirement, was to be THE LOWDERMILK SCHOOL OF AGRICULTURAL ENGINEERING. I was deeply touched by this high honor.

The Role of Science and Technology in the Development of Emerging Nations, 1960

Chall: How long was it before you made another trip to Israel?

WCL: A year later, in August, 1960. I was an official delegate from the United States to a conference, called by Mr. Abba Eban, on "The Role of Science and Technology in the Development of Emerging Nations." The U.S. Science Foundation could pay only my expenses and not those of my wife, so I made this trip alone. This was, of course, unusual, for we nearly always went together.

This international conference was held at the famous Weizmann Institute at Rehovot , one of the foremost scientific institutions of the world. Dr. Weisgal, head of the Institute, organized the Conference with great efficiency. Abba Eban invited Nobel Prize winners and many leaders, both from the advanced, highly developed nations and from the lesser developed emerging countries. More than three hundred delegates, representing thirty-one countries from five continents, met together for a period of three weeks, discussing problems and possible solutions.

Here in sympathetic discussions, outstanding scientists from many advanced nations grappled with the problems of the Afro-Asian emerging nations as presented by their representatives.

WCL: There were a few specialized tours, but the conference was largely given over to special papers and discussions. Most delegates were housed on the beautiful grounds of the Institute and this gave many opportunities for the mingling of delegates of the many nations represented.

Chall: Apparently Mr. Eban, as President of the conference, created a stimulating atmosphere for discussion and cooperation.

WCL: Yes, as usual. Dr. Eban gave a brilliant opening address and many other short talks in various discussions. He emphasized that we must survive as a human race or not survive at all. Emphasis was laid on the fact that affluent or "have" nations are getting richer and the poorer or "have not" nations are steadily getting poorer. The gap is steadily widening--there is an economic gap, a cultural gap, an educational gap, a technological gap and a financial gap.

Solutions to Population and Economic Problems

WCL: The African delegates, speaking for their countries, did not want to wait for the slow growth and development that has made the "have" nations rich and stable. They wanted the latest of all technical developments, regardless of cost, to be given them, even though they had no trained technicians to carry on and make use of them.

When an attempt was made to put through a resolution on birth control, after being told that food production was increasing at best only two and a half percent yearly while populations were increasing three percent and more, the Afro-Asian nations voted down the resolution saying, "This attempt to control population was a white man's trick to limit black populations." They said, "On the other hand, we want to increase our numbers so as to have more power and more influence in the United Nations and in world affairs."

Chall: Have they recognized that political independence for them has not brought the economic independence they also dreamed about?

WCL: They had an interesting solution for this question. Of course, all recognized that financial aid was indispensable for their development. They felt this was due them from the affluent nations. When a Danish banker suggested that the advanced or affluent nations should put two percent of their national gross output into a Development Fund, to be distributed to the emerging nations, the Afro-Asian agreement was spontaneous.

WCL: I then arose and asked who would determine how these vast sums would be spent and what checks would be placed on expenditures. This was an unpopular question and nobody wanted an answer.

The Afro-Asian countries insisted that funds should be given to them without strings attached, and each recipient nation would determine how the moneys would be spent and would not have to give an accounting.

But it was also brought out that the poor nations were poor credit risks and that there was no way of collecting, especially with their attitude of wanting to outsmart or trick the white man. It was brought out that foreign salesmen, selling tools, machinery and the like, to the African are sometimes tricked.

The African goes to the U.S. Consul and obtains permission to buy on credit; then articles are damaged and the African wants to return them. The salesman does not want to ship back the damaged machinery, or whatever has been sold, and so reduces the price drastically or gives them away. The net result is that the foreign salesman lost money, the manufacturer lost the sale and the African got the articles for little or nothing.

This type of dealing is fair game for the African, for he feels he has outsmarted the white man. If objections to further credit are then made, the African resents this, saying that he is not being treated as an equal. Thus some discussions turned out to be very frank, and revealed the difficult problems involved.

Variations in Per Capita Income

Chall: How was it determined which were "have" nations and which were "have not" nations?

WCL: The division was made on the basis of average annual product per person: nations with less than $100, nations between $100 and $900, and nations with an average of more than $1,000 per person. The latter were considered affluent nations.

The 1968 Reader's Digest Almanac and Yearbook lists these national average incomes for the year 1967. The six years which have elapsed since the Conference haven't brought about significant changes, so the figures I'll use are from this source.

There were delegates from some twenty-five or more new countries whose average annual incomes were less than $100 per person; for example, Ethiopa, $50; Burma, $70; India, $60; Pakistan, $87; Sudan, $90. Egypt with the richest lands on earth has the poorest farmers. Though she sent no delegate, Egypt has

WCL: an average annual income of only $135.

There were many delegates from nations with an average income from $400 to $1,000: Japan, $687; Spain, $770; Greece, $730; Italy, $883; Argentina, $765; Russia, $917; and numerous others.

Then there were delegates from the advanced or affluent nations such as the United States, with an average annual income of $2,924 per person; Switzerland with $2057; Canada with $2151; Austria, $2,000; Holland, $1696; England, $1609; France, $1446; Belgium, $1447. Even the State of Israel, only nineteen years old, has an average annual income of $1080 and is extending technical assistance to many of the new nations. She is the success story of all the emerging nations.

But the great gaps between the affluent and intermediate nations, and the "have not" nations are a decided barrier to the progress of the emerging nations, unless effective collaboration can be achieved. The purpose of this conference was to find ways in which "have" nations could assist "have not" nations to solve their problems and more quickly raise the standard of living of their peoples. All felt this was a successful conference.

Seeing How Israel Restores the Land

Chall: You mentioned that there were only a few tours. Did you go on any?

WCL: Yes, most of us went down to the Arid Zone Research Station near Beersheba. Here, vegetation is tested for its tolerance of brackish waters, to enable peoples to live and grow food for themselves without fresh water. Israel scientists had invented a desalinization machine about the size of a washing machine that would make a cubic meter of fresh water daily for household use at allowable costs.

Much of the Negev desert in Israel has only brackish water which is found in many other arid regions of the world. We visited Avdod, where there is a fascinating experiment. Professor Michael Evenari has reconstructed some of the ancient Nabatean farms, and has grown crops on the scant desert rainfall of the region by conducting storm water from surrounding slopes onto the fields and terraces of alluvium planted to orchards and grains. It was thus that the ancient Nabateans were able to populate the region and live off the land. They also gathered rain water into cisterns for drinking water for people and livestock.

We also visited Sde Boker, where excellent soils of coarse loess are made use of by diversion of storm waters and their

WCL: storage behind dams. This makes irrigation possible in the desert which otherwise would not be productive. Ben-Gurion was much interested in this type of reclamation of the desert and lives in the kibbutz Sde Boker. A new university is being established nearby.

Of course, delegates were also shown Israel's modern works of land use to increase production, such as contour layouts with broad base terraces, diversion and drainage works and recharge of ground waters. Delegates also saw irrigation of various types: sprinkling, furrow irrigation, flooding and drainage. They were also taken to see re-vegetation of the overgrazed grass lands that had been restored.

All marveled how Israel had reclothed the naked hills with tens of millions of forest trees, as well as with orchards and vineyards planted on rebuilt rock wall terraces much as was done in ancient times.

Chall: What seemed to impress the delegates most?

WCL: Well, of course it was Israel's remarkable increase in production of foods, fats and fibers to meet the needs of her rapidly growing population with enough agricultural surplus for exports to pay for imported foods such as meat, tea, coffee and hard wheat.

Of course the background for this remarkable achievement is the brilliantly engineered Master Water Plan which conducts water from the upper Jordan into a water grid that picks up water from anywhere and everywhere available and distributes it wherever needed down through the country and into the Negev desert at the south. Thus these fertile but dry desert lands produce two and three crops annually with high yields instead of the meager crops caused by droughts of the past.

All delegates were impressed with the scientific vigor of this new nation, then scarce sixteen years old, its remarkable practical achievements and the devotion of the people to this "old, new land" which they have reclaimed.

Special Guests of the State of Israel, 1964

Chall: I believe you made one more trip to Israel, did you not?

WCL: Yes, and this last trip, during the month of June, 1964, was the mountain top experience of our entire lives. It is unusual, but how gratifying, for a man to dream dreams, work hard to make them realities and to live to see them come true. On this last trip to Israel, we saw the fulfillment of my dreams for this Holy Land that began in 1939--just twenty-nine years ago.

This time it was no conference that caused us to go, but a special invitation to come to Israel for a month as guests of the various departments of the government in which I had worked, namely, the Department of Agriculture, the Soil Conservation Service, the National Water Company, "Tahal," and Technion, Israel's Institute of Technology. Each of the four rolled out the red carpet for us for a wonderful week of social festivities and inspection of all lines of progress in these various departments where I had served.

Dr. Lowdermilk Sees His Biography on the Land

WCL: "My boys," of the Soil Conservation Service, took great pride in showing me thousands of miles of broad base terracing, check dams without number, and other measures to recharge ground water aquifers. They were proud of their rock wall terraces on the contour, making possible cultivation of mountain slopes, and of the many reservoirs to impound flood waters which allow Israel to receive and to make the most of blessings of heaven in the rain that falls.

As I traveled about to see the many soil and water conservation works, I felt that I had written my biography on the lands of Israel.

"Father of the Water Plan"

Chall: I am sure this must have given you great satisfaction that the age-long erosion is rapidly being checked. What was your second dream that was fulfilled on this 1964 trip to Israel?

WCL: I confess I was very excited to see the Master Water Plan completed, of which the 108-inch pipeline is the central feature. It was exhilarating to see the great pumps and siphons and 108-inch pipeline, and drive along beside the picturesque open canal, with its clear Jordan waters, winding through the hills of Galilee and converging on the great reservoir where it is finally linked with the entire, brilliantly engineered Israel Master Water Grid.

Israel officials graciously called me "the Father of this

WCL: water plan for Israel." So this dream too was fulfilled on this last visit. Much credit for the successful completion of this Master Plan for Israel is due to the genius of Dr. Aron Wiener, Director General of Tahal (water resources of Israel), and his able staff. Mr. Doran, the Deputy Director of Tahal, personally conducted us over the entire system for almost a week. It was a most gratifying and stimulating experience.

Chall: What was your third dream that was fulfilled on this 1964 trip?

WCL: Before I left, the Department of Agricultural Engineering was flourishing and housing facilities were urgently needed. Before I left Israel in 1957, we had worked out the blueprints with the Technion architect and the agricultural engineering staff for a complex of buildings to house the modern activities of this new department at Technion.

In 1953, when under appointment to return to Israel to develop this new department, I made a number of fund raising talks in the United States. Mr. Samuel Brody, of Detroit, Michigan, donated $100,000 to construct the first wing. But Technion was hard up trying to build a new campus and priorities were given to older departments. So for eleven years the Department of Agricultural Engineering had had inadequate and crowded facilities, borrowed from other departments, even though funds had been donated for the buildings.

Breaking Ground for the Lowdermilk School of Agricultural Engineering

WCL: During the first week in June, 1964, we were the guests of Technion at the many commencement activities. At this time, Technion board members from the United States, England, Canada, France and South Africa also convened, so it was a gay and happy time of reunion. But the climax for us, and the highlight of this trip, was the public ceremony to break ground for construction of about a million dollar building to house the Lowdermilk School of Agricultural Engineering.

On the site where the new buildings were to rise, chairs had been placed facing the magnificent view of Haifa harbor, the Plain of Emek and the Lebanon mountains. Higher up on Mount Carmel and on either side towered other buildings of the new campus. They are deeply anchored into rock foundation of historic Mount Carmel, and will last a thousand years or more. They are built of Israel stone and concrete, and are a living monument to the vision of early pioneers who founded this Institute of Technology with small beginnings thirty years ago and gradually

WCL: developed this magnificent campus.

There were speeches by General Yacov Dori, President of Technion, and by Dr. Herman Finkel, Dean of the Department, and by several government officials. Then I made the last talk, on the fulfillment of my dreams for Israel,* and just as the sun dipped over the horizon, I closed with "The Eleventh Commandment" that I had first given over the radio in Jerusalem in 1939, and dedicated to the fine work of the Jewish agricultural colonists whose good stewardship of the Holy Earth had inspired this idea.

I then walked to the side and pulled the switch to set off a sharp explosion that sent red earth and rocks high into the sky, to start construction of the urgently needed buildings for the Lowdermilk School of Agricultural Engineering. Many who had attended all or most of the former ground-breaking ceremonies for new buildings said that this one was the most beautiful and effective they had ever attended.

It is difficult to visualize or to estimate the tremendous influence and benefit that will come from the training given here that will enable nations to improve their lands and produce more food for the alarming increase of future populations around the world.

Then after a week as guests of the Department of Agriculture, which included entertainment in Tel Aviv by government officials and as guests of President Shazar in Jerusalem, we had three delightful days at the Weizmann Institute guest house in Rehovot. We made some interesting side trips, such as down to see the atomic reactor. Experiments are going on to develop peaceful uses for this new found energy, particularly for the desalinization of sea water--a must for Israel in the near future.

So ended the mountain top experience of our sunset years.

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*"The Last Frontier," June 15, 1964.

Part 4 An Evaluation of the Jewish-Israeli Farmer

[Written questions and answers]

Chall: As a result of your studies and travels in other countries, you have given your opinions about Chinese farmers, the African farmers and what happened to lands under nomadic Arab occupation, but as yet you have not evaluated the Jewish-Israeli farmer.

WCL: Well, I would say that the Israeli farmer is exceptional. For almost two thousand years, farming and land were denied to Jews with but few exceptions. When Jews began to flee the pogroms of Russia and to return to the land of their fathers, they were not farmers. Instead, they were lawyers, doctors, teachers, bankers and businessmen of many types. They came from almost every line except that of farming.

Immigrants to Israel had little or no traditional knowledge of farming. In one way, this may have been beneficial, for they were not set in the ways of traditional farming and so accepted new ways quicker and easier. They had less to un-learn.

Motivation

WCL: This new Jewish farmer was very different from farmers of other lands, where farm children grew up in rural areas. Some followed their fathers' footsteps and became farmers. Farming thus became traditional for them. They accumulated much traditional lore based on trial and error that is still useful. All these other farmers that I have known had as their main purpose the growing of food for their landlords, for themselves and their families, and if possible, some surplus to sell so as to buy some of the good things of life they wanted.

But with the Jewish farmers coming to Palestine during this century, the purpose was not primarily to grow food, but to redeem the land from the man-made desert that had overwhelmed the country during the past twelve hundred years of wastage by soil erosion and neglect under an economy of Arab nomads and their herds.

Of course, the Jews in Palestine needed to grow food. But the motivation was embodied in a religious zeal to reclaim the

WCL: lands and make them productive again--lands that had been denied them for two thousand years and for which they had longed and prayed with the hope, "Next year in Jerusalem," at each New Year.

So it was a double purpose which drove the Jewish settlers to farming. No sacrifice was too great, no work too hard, no enemy attacks too vicious to deter them from this idealistic purpose of reclaiming and defending these works in their ancient homeland. The early comers were killed off by malaria in great numbers, draining deadly swamps which absentee Arab landlords were willing to sell at high prices. But as one group died off, another group took its place, until the lands were drained and malaria eradicated. After that, they could build homes and grow their own food.

These early pioneers began with a powerful drive to provide a homeland in the land of their forefathers as the only realistic and permanent solution for Jewish people forced to flee country after country. When Jewish immigrants, fleeing pogroms, settled in the United States, they fitted themselves into an existing economic structure, often contributing to its further development.

But the newcomers to Palestine had to build their own economy in a backward and long misused land. They realized that the foundation for an enduring state must be anchored in agriculture and to do this required improvement of the land regardless of difficulties, toil, dangers and costs.

They faced the problem of establishing a type of agriculture that would support a comparatively advanced European standard of living in the midst of the primitive subsistence farming and low standards of living prevailing in the East and also compete with low-priced crops of Egypt and Syria where labor, especially that of women and children, was sadly exploited.

Cooperation

WCL: A Jewish pioneer writer, A. D. Gordon, preached a religious doctrine that this development of farming and reclamation could not be achieved through cheap hired labor of local peoples; but rather that it must be done by the personal labor of each individual Jew, putting into the task his intelligence, his soul and the strength of his body.

In other countries, farmers are individualistic and very

WCL: independent. But Jewish farmers were confronted with laborious projects of draining swamps, of rebuilding terrace walls, of destoning great boulders from valley lands and of controlling the greatest enemy of the land--soil erosion, that had been destroying the land of Israel for centuries.

These jobs of reclamation were beyond the capacity of individual farmers. Most Jewish immigrants had fled persecution and had come with little or no capital. They worked out something unique by banding together in cooperative settlements that were democratic. No government, as in Communist countries, laid down the law to them as to how to farm and what crops to grow.

They worked together with one mind and one purpose--to make the land productive again to supply their needs and prepare the way for others that would follow them. They asked for very little: a roof over their heads, whether tent or wood, primitive living with few comforts. But these immigrant farmers all worked with one mind and one heart to reclaim the land and to improve its soils.

Many peoples could not have accepted this cooperative type of work where, without personal compensation, each works hard for the group. Perhaps one reason why the Jewish immigrants were doing what I called the finest colonization of modern times was because Jews have been forced to look after their poor, their aged, their orphans, their sick, and help one another in every way possible, just to exist, as a result of the vicissitudes of being a people without a country through the centuries.

While this type of democratic agricultural settlement would be most advantageous for the development of many of the African countries or in South America, they do not appear to catch on with the people who most need this type of more rapid development.

A Mind to Work

WCL: This ability of the Jews to work together began a long time ago when Nehemiah and some Jews came back from Babylon to rebuild the walls of Jerusalem that had fallen down. They were under constant attack and were confronted with obstructions of many kinds so that they had to work with a shovel in one hand and a spear in the other. But Nehemiah said, "So we completed the rebuilding of the wall of Jerusalem, for the people had a mind to work."

WCL: So it has been during these years of modern reclamation work. The Jewish farmers were under constant attack and were held back with physical and political obstructions; but these Jewish people, here in their ancient homeland, have had a mind to work and nothing was permitted to deter them except temporarily, until they could overcome whatever obstacles faced them.

When I first made my study of Palestine in 1939, these business and professional men, who had turned farmers, had only reclaimed about six percent of the land west of the Jordan. Yet I remember saying many times that I found these new Jewish farmers doing the finest reclamation of old lands I had seen in three continents, along with establishing the most successful agricultural settlements of modern times.

Education

WCL: One secret of their astonishing success is that they farmed with their intelligence as well as with their hands. They studied the traditional farming of the Arabs, and Dr. Ruppin and Dr. Volcani were the ones who evaluated it and established the point of departure from the local traditional farming to scientific farming based on technology.

Furthermore, these Jewish farmers studied what had been done in other countries and eagerly sought expert advice and then often found better ways to do the job. I had to be very careful not to make suggestions until I was doubly sure they were best for a particular slope or soil, for these farmers were eager to put in immediately whatever measures I suggested.

These Israeli farmers are making a world-wide reputation for themselves. A recent study made by the United States Department of Agriculture in twenty-six of the new Afro-Asian States announced that Israel topped the list in every category of agricultural development, and in production per acre and per man.

It is little wonder then that people from these new emerging nations come by the thousands to study what Israel is doing. They also urgently request that Israeli experts help them apply the same methods in their own countries. Israel farmers have made Israel a pilot project for all nations whose economy is now based on subsistence farming and who must change over to some industrialization if they are to be viable states. This includes almost two-thirds of mankind today. These Israeli farmers have

WCL: demonstrated how this can be done in a few years when the people have a mind to work together to make their lands productive by modern scientific methods.

Success

WCL: I was assigned by the United Nations Food and Agricultural Organization to Israel at a time when Israel was doubling her population in four years' time, a thing never done before in history that I know of. But on these old worn-out lands, with vision, hard work, courage, application of modern science and technology, along with a minimum of financial assistance, the Jewish farmers at first endured tragic austerity living cheerfully and proudly.

But the Good Earth quickly responded to the loving care of these farmers and soon their lands were producing a surplus of fruits and vegetables, even for the rapidly increasing population.

Now the little country, under such care, is growing eighty percent of its food requirements. Besides, Israel exports enough agricultural products to pay for what she has to import in the form of hard wheat, tea, coffee, meat and the like.

So I would say that the Jewish farmer has laid a sound foundation in production of abundant food stuffs to enable this progressive, democratic nation to grow and develop into the future, along with giving her people the highest standard of living of any country in the Middle East.

This efficiency releases many of its citizens to work creatively in many world renowned educational and research institutions in Israel and also enables her to export her technical "know-how" to developing countries around the world. So, I say: three cheers for the farmers of Israel and their exemplary reclamation of the Holy Earth.

But with all these accomplishments, the Israelis are not resting on past achievements. They are looking forward to an increased population if or when Jews are able to leave Communist or Arab lands. Many Jewish farmers are happy with their independent life as individual farmers in a Moshav, with cooperative buying and selling.

The Future

WCL: But in order to bring about maximum production of all available lands in Israel, and pay rapidly rising labor costs as well as to produce in competition with farmers elsewhere in exports, Israel has gone ahead rapidly with large-scale mechanical farming with the latest modern methods of irrigation and fertilization.

It was Sam Hamburg, a large-scale farmer from California, who first went to Israel to direct them in this new type of agriculture. It was he who directed the establishment of large cotton plantations, followed by large plantations of sugar beets, sisal for rope making and the like.

This large-scale farming also included growing of citrus crops, which are Israel's largest agricultural export, along with supplying an abundance of citrus for her two and a half million citizens.

With the coming of the State, the government of Israel found herself suddenly with large areas of "Crown Lands" held by the British Mandate government. These had to be put rapidly into production; so companies were formed and citrus groves, ranging from two to five acres, up to large groves, were sold to absentee Jewish families in England, France, Canada, South Africa and the United States. These combined groves are farmed in blocks. As citrus trees grow, annual crops not only pay for the modern mechanical farming expenses, but have been paying good dividends, I am told.

With this experience in rapid development of lands for maximum production, Israel is now planning reclamation and production on tens of thousands of additional dunnams of land as a result of the "Six Day Miracle War," in June of 1967, which brought under Israeli control former demilitarized zones and additional lands that must belong to Israel to secure her boundaries from constant Arab attack on her citizens, such as the Golan heights. Of course, this development and reclamation work is dependent in large measure on the waters available for irrigation and domestic uses.

Israeli farmers have proved very successful in working out new methods of mechanical planting and harvesting that are being adopted in other countries. In Israel, the farmer is not looked down upon as has been the custom in other regions. Farming rather has become the occupation of some of the best brains of the country. This change in view brought rich rewards to Israel. As the works and examples of Israeli farmers spread to other parts of the world, the blessings of their achievements will go on and on into the future.

XVI ASSIGNMENT IN YUGOSLAVIA, 1957

[Written questions and answers]

Chall: Dr. Lowdermilk, when you retired on your seventieth birthday in Israel in 1957 after ten years of work overseas as consultant in various African countries and Israel, you said you were returning to your home in California for good. How did it happen that instead you went to Yugoslavia for a United Nations assignment under the Food and Agriculture Organization?

Dr. Lowdermilk's Skills Needed in Yugoslavia

WCL: Of course, I had to stop over in Rome to report to the F.A.O. headquarters on my six years of work in Israel. Dr. de Vidja, Chief of the F.A.O. Division of Waters for Irrigation, called me into his office. He said that a call had come to him from Yugoslavia for help to work out a little T.V.A. for the Cetina River in the Karst region on the Dalmation coast of Yugoslavia, as a pilot project for the region.

This would require the coordination and integration of the various departments working in the region. This took in forestry, soils science, geology, grazing enterprises, hydrology, including drainage, irrigation, control of storm waters and of soil erosion, and all phases of agriculture. All these subjects involved many different departments that had not been working together or coordinating their efforts.

Then de Vidja sought to flatter me by saying that if I would accept this challenge, he would only have to send me, but if I did not go, then he would have to send three men to cover these various works. Whereupon I accepted this short assignment. We arrived in Belgrade, July, 1957, and spent about three months.

Chall: Is there a published report by you on this work in Yugoslavia?

WCL: Yes. Before leaving Yugoslavia, I completed and had translated what I called a suggested basis for discussion with all my counterparts, including several local farmers, which the government officials seemed to feel was most unusual. In this week of conferences or round table, questions were asked and answered and

WCL: discussed.

My official report to the Food and Agriculture Organization was under the Expanded Technical Assistance Program of the United Nations and was published in Rome, 1958, as Report No. 769, entitled The Report to the Government of Yugoslavia on the Solution to Problems of the Cetina River Valley.

Hotel Room is "Tapped"

Chall: How did you go about this assignment?

WCL: First I had to go to Belgrade to be briefed by high government officials. This was during the hottest spell on record in Europe. We were given cordial treatment by officials and put in a very good hotel in what I presume was a V.I.P. suite. We were told by Mr. Gurman, I believe that was his name, an American, who had already disbursed in Yugoslavia almost a billion dollars in American foodstuffs by 1957, that during this "get acquainted period" our room was probably "tapped," or "bugged."

Because of the great heat, we spent much time in our room and pondered where "Big Brother" might be listening. My wife speaks Chinese quite fluently and had fun interspersing our conversations with Chinese sentences, just to give possible listeners a bad time.

When travel arrangements had been completed for our long auto journey to our headquarters at Split, we checked out. At the last minute, my wife decided to run back to the room to see if she had left an earring in the bathroom. Her arrival startled a man on a high stepladder, removing the microphone from inside the glass overhead electric light.

The embarrassed man fled with his little gadget while my amused wife enjoyed for days their consternation at the peculiar conversations of these Americans who also talked in a foreign language that no one could recognize.

Chall: This was an interesting sidelight for you. Did you have any other outstanding impressions in this new area of your studies?

First Impressions of the People

WCL: Yes, we were quite shocked at our reactions. We had been conditioned by several years in Israel whose young people sing, whistle, folk dance and hand clap to rhythm more than do young people we have found in any other country. The Israeli youth, eighteen to twenty-four years old, during their army training looked and acted happy and important.

Here in Yugoslavia, no one smiled, soldiers looked glum, no one sang or whistled, people did not stop on the streets to visit, everyone walked briskly, intent on what he had to do. No one was ragged, but clothes were patched--sometimes patches were patched. Everyone seemed so poor.

Housing had been taken from owners and all families were crowded into one and two rooms; generally, there was one kitchen lined with stoves in houses in which formerly only one family had lived. Government collected all rents. They were very reasonable as was also transportation. Movies, plays and musicals were subsidized and cheap.

About three percent of the population were card-carrying Communists but they had the power of life and death over the ninety-seven percent. All businesses employing three people or more were taken over and run by the government. Cash, bank accounts, buildings and homes were confiscated and owners given back only one to three rooms, according to the size of the family.

No one dared to complain. We were quick to detect those who were Communist and who were not. Those who were not carefully looked around in both directions before answering to see if anyone was listening nearby whenever they answered our questions about conditions or politics.

Chall: Apparently your first impressions were somewhat depressing.

WCL: Yes, but this experience in Yugoslavia was a fascinating and challenging one, and I would not have missed it. It was impossible to get reservations out of Belgrade for Split by train, which would take seventeen hours, so our American representative allowed us to use his car. The government paid the gas which we were told made the cost five times as much as if we had gone by plane.

Hand Labor in the Fields

WCL: We traveled fourteen hours across the heartland of this country which is full of history since Greek times. First, for two hundred miles, we followed the Sava River on a highway built by labor donated by youth organizations. During this distance we only passed forty vehicles, including autos, trucks and motorcycles. The harvest was on, yet we did not see one mechanical harvester and only three reapers drawn by horses.

All crops were being cut with a large scythe by men and boys while immediately after, women and girls raked the grain and tied it in bundles and stood it in shocks. Our hearts ached and our backs hurt just to watch them. The farmers make up sixty-five percent of the population and appeared very poor. We saw no electrification in rural areas and all was hand labor except for horses and wagons to haul the hay.

The small fragmented fields provided evidence of why Tito found it practically impossible to set up collective farms. After forcing the issue on about a third of the farm area, he found the resistance of farmers so great that collectivation had to be undone, so that only about eight percent of farms are in collectives. These mostly were used as demonstration farms.

After leaving the Sava valley, we dropped southward over dusty, bumpy roads, for we were told that only four percent of the roads of Yugoslavia in 1957 had been surfaced. This was a picturesque drive through rugged mountain country where life seemed very harsh and the poor soils yielded small returns for hard labor on them.

Headquarters at Split

Chall: Had special arrangements been made in Split for your arrival?

WCL: Yes, we were most cordially received by the government officials. We had splendid reservations at the Park Hotel on the beach as headquarters. Marcel Jelaska, head of Viticulture, and Dusan Jedlowsky, of Forestry, took charge of me and conducted me to all the various heads of departments working in the Cetina Valley.

It was rather startling to find that none of these men or

WCL: their institutions had been collaborating or integrating their various works. I realized that this would be an important part of my task. I visited all thirty of the leaders personally before calling them all together to discuss what could be done and how each had an important task to bring about full development of the Cetina Valley as a pilot project for all the Karst region of Yugoslavia.

Chall: Your headquarters were in Split, but your work was in the Cetina Valley. How far apart were they?

WCL: About every other day, we drove twenty miles over the coastal mountain range into the Cetina Valley and there I worked up and down the valley twenty miles each way and, by horseback, into the steep mountain villages and grazing lands.

Again here, it is a tragic story of abuse and misuse of natural resources, to read the records in the landscape left there by man's long occupation of these once beautiful lands. The mountain slopes were overpopulated, the lands desperately overgrazed, most of the soils were washed away leaving the glaring rocks of the Karst landscape exposed. The valley lands during winter rains became swampy and produced only sedge grasses of little nutritious value for herds.

Serious Farm Problems

WCL: The problems of setting up a pilot project for the region were tremendous. There were 58,000 people in fifty-three villages whose livelihood depended on 13.7 percent of arable land in a low state of production, and on herds of sheep and cattle not in good condition that grazed eighty-four percent of the area which was in an advanced stage of "degradation." Forest and forage growth were depleted by soil erosion of the past and subject to wind erosion by the dreadful Boro annual winds.

These fine hard-working people were faced with a growing critical situation and required help quickly. I asked many what they felt the solution would be, and all replied, "Reduce the population of the valley and their herds." Then they laughed and said, "But this cannot be done, for there is no unoccupied land anywhere to make room for them."

Piles of stones were mute evidence on cultivated slopes of the progressive loss of topsoil in heavy rains. One farmer said,

WCL: "My fields grow more rocks each year."

I felt that the natural resources of the valley could be improved with the help of modern applied science and technology, to bring about better agriculture and forage production. Everywhere the corn was stunted. There was practically no irrigation. Although there are many springs yielding abundant water for irrigation along the Cetina River, yet I found only one place irrigated.

There was no rural electrification. The people were desperately poor, yet more hard work in their present state brought no extra rewards.

While the country as a whole has a literacy rate of more than eighty percent, the average yearly income today, in 1968, is only $294. It is especially disturbing to see such fine people--of our kind and intelligence--so eager and hard-working, caught in this condition of poverty. They can do practically nothing without considerable help from government and modern science and technology, which has previously not been available.

The well-built stone farm houses with tile roofs, which may be centuries old, gave the countryside an appearance of prosperity and stability, but looks are deceiving. Women age early from hard work; while tending sheep, they spin wool into threads and knit their clothes and maintain their pride by embroidering aprons and blouses of wool. There is no money for personal repairs.

I found these courageous farm peoples proud, hospitable and intelligent. They worked hard from dawn to dark, for an annual income that would bring lethargy and hopelessness to many other peoples that I have seen.

Planning the Little T.V.A.

Chall: How did you go about working out a little T.V.A. for the Cetina Valley under these distressing conditions?

WCL: As I described previously, I called on the heads of all the institutions and agencies who were working in the valley and found out what they were doing. Then for the first time, I was able to gather them all together and present to them the over-all problems and what could be done by coordination and integration of all agencies and works.

WCL: I suggested they form an inter-agency committee under the leadership of a full time director, to work out an integrated program. This director should have high qualifications, be an experienced engineer or scientist with an understanding of, and sympathy with, mountain villagers and their problems, and with a capacity for getting things done. The government should be requested to appropriate funds to prepare this integrated program within a year or less.

Pasture Management

WCL: I suggested the Yugoslav government apply to the Food and Agriculture Organization for technical assistance by foreign experts. I suggested that all concerned take an inventory of all the resources of the valley and list their possibilities for development. I suggested that the Forest Service, in addition to its present authority and activities, should be authorized and financed to carry out scientific pasture management and improvement for all "Commons" lands suitable for grazing of livestock and to set the carrying capacity of pastures and restrict grazing. I indicated however that restrictions should be held up until ample substitutes were worked out to compensate local people for the loss of income from reduced numbers of livestock.

Some farmers enclosed private grazing lands within a wall and thus could maintain their ranges. But each farmer could run herds on the "Commons" without controls or restrictions, with the result that rapid and almost complete destruction of grass and forage was taking place.

I also suggested that a study be made of ground water hydrology to supplement seasonal surface waters and to introduce irrigation wherever possible.

Electricity

WCL: The hydro-power project with an eight hundred foot drop near the mouth of the Cetina River was well under way. The plan was to export and sell the electric power over the border into Italy. We were told that three-fourths of Yugoslavia's electric power is thus exported.

I discovered they had no plans for rural electrification of the Cetina Valley and had only considered the project as revenue in export for the nation. I expressed my shocked concern and

WCL: said, "Do you mean to tell me that you have not considered the needs of the local people for rural electrification?"

It was evident that it had never occurred to them. However, we got rural electrification incorporated into the plans for the Cetina Valley integrated development.

All my associations with the various institutions and their leaders, with the government officials and with the farmers we visited (and whom I invited to sit in on our round table) were most cordial, and I felt they had begun a new era for integrated development. It was gratifying to me to know that they immediately began to take action, because later they sent me a full report of several volumes on how they were carrying out the program.

These were all in the language of Yugoslavia, which of course I could not read, so I gave them to the famous hydrologist, Dr. Nathan Buras, who is Dean of the Lowdermilk School of Agricultural Engineering, at Israel's Institute of Technology at Haifa, Israel.

Asking the Farmer

Chall: Did you suggest what work to begin immediately?

WCL: No, but I turned to a farmer named Lelas Bako, who had impressed me with his efficiency in managing his small farm, and asked him what he would suggest. The officials seemed surprised that I would give such importance to a dirt farmer. But he gave a very sound suggestion that could be begun at once: to drain the marshes and cover them with ground limestone, which was everywhere available.

This would change the reaction of the soil, discourage the non-nutritious sedge grasses and favor the growing of legumes and alfalfa, thus giving the land a higher carrying capacity for livestock. Then I praised the farmer for his valuable suggestion.

Irrigation

WCL: To one from California, it is a shock to see water going to waste when irrigation would increase production and raise the living standards of the people. When I bemoaned this lack of irrigation, I was told that because of the fragmentation of the

WCL: valley into such small farms, it would be very difficult to get rights of way for canals across the innumerable property lines. But this will have to be done through the formation of irrigation and drainage districts, as we have done in the United States.

I also suggested that the women be trained in the canning and preservation of foodstuffs to carry foods over into the winter season.

Chall: If the annual income per capita was only $294 annually, then farm production must have been very low.

WCL: Yes, I found that it was impossible to get any production figures at all. The reports were expressed in terms of percentages: so much more than previous years, or so much more than before the People's Government took over. There was nothing to check actualities. I felt the people were being denied information they should know.

Lack of Religious Liberty

Chall: Did you find that the Yugoslav government hampered religious freedom when you were there?

WCL: It was an interesting experience. Church bells rang, we went to church a couple of times, but the audience was entirely older citizens. We were told that only those went to church who had nothing to do with youth, or teaching or the army. In other words, if you had no influence, you could go to church. The Communists had devious ways of finding out and meting punishment.

While we were there, the Social Chronicle, dated Dnevik, Novi Sad, July 11, 1957, told of the teacher, Olga Turcan, who returned from her Collective to be married in her village church. The priest who married the couple had known her since childhood and gave her a gold cross, commending her on her faithfulness and service in playing the organ.

She was immediately expelled from her communal settlement and also from the school where she had been teaching. They then decided on a trial to see if she could be thrown out of the entire teaching profession permanently. At the trial, no legal grounds were found to do this, but they decided it must be done on moral grounds. It was considered unthinkable that children should be taught such heresy as belief in God and Olga Turcan

WCL: was expelled forever. This story was reprinted in other papers.

Yugoslav-American Relations

Chall: How did you get your "inside" information when you do not speak or read the language?

WCL: Our United States Embassy and Consulates issued short News Letters giving international and local items of interest, and in one of these we read about Olga Turcan. Then too, we made some close friends.

But only when we were out in the fields, perhaps sitting on a stone wall where there were no eyes or ears nearby, were we told intimate heartaches and problems. They said that at the time of Yalta, for about four days, they were holding their breath, so to speak, and praying desperately that Yugoslavia would be put under the western block along with West Germany and Austria.

Stalin wanted Yugoslavia in his block. Churchill wanted Yugoslavia in the western block, so it was Churchill and Yugoslavia against Stalin, with Roosevelt the deciding factor. Roosevelt insisted that Yugoslavia be given to Stalin, on the basis that this would make Stalin happy and more tractable to deal with. So Roosevelt sold out these fine people to Stalin.

Immediately after, the U.S. began to feed the starving Yugoslav people and have spent two billion and more, just to keep Tito from being one hundred percent Communist. How stupid can a nation be? Adjoining Austria, with help from our Marshall Plan, now has an average income of $2,000 per person annually, whereas Yugoslavia, with such fine and hard-working people, still exists on an average annual income of $294.

Chall: Was the United States still providing free food for Yugoslavia when you were there?

WCL: Yes indeed--by two methods. While we were there, the Lutheran church, along with other generous Christians including Quakers, was putting on one of the greatest humanitarian jobs ever. They arranged for the United States government to provide the foodstuffs free, such as wheat, cheese, milk powder, and other surplus commodities; and the church provided transportation and all other costs to feed two million school children one free hot meal

WCL: a day in ten thousand different schools. The Lutherans were not allowed to administer distribution but had to do it through Yugoslavian social organizations. We could not find out whether the recipients of this humane feeding of two million children were told the source of this generosity, or whether they were allowed to think it was done by their Communist government.

When in a coastal village, I saw through the store window quantities of foodstuffs marked with a double handshake, and the words "Gift from the American people--not to be sold." We went in and had a sandwich made from American flour and American cheese and paid for it. I wanted to take a picture of this American food being sold in a public market, but the officials with me objected.

By the time I returned to Split, word of this incident had already reached high officials, and immediately the political boss of the district invited me to his office to try to explain why they were doing something that was apparently contrary to agreements for receiving free food. I did not altogether agree to their excuses for selling all these things, but apparently it was to bring more income and prosperity to this poor region that only grew grapes.

However, I do not begrudge, as an American taxpayer, anything that we have done to help these honorable, hard-working, long-suffering ninety-seven percent of the population that our country, under Roosevelt, consigned over to the Communists at Yalta.

Chall: This is information that we generally have not heard about.

WCL: We are most appreciative that de Vidja of the Food and Agriculture Organization offered me this short assignment to Yugoslavia. It gave me an appreciation of the country and its hospitable, hard-working and responsive people.

Dr. Lowdermilk Leaves Amid Praises

WCL: We left by boat about six in the morning. At five thirty, several of the government officials with whom I had been working, along with their wives, brought gifts and best wishes for bon voyage. It was here that they paid me the most satisfying compliment ever when they said, "Lowdermilk has been the most democratic and understanding man that has come to us from the United States or the United Nations."

XVII TECHNICAL AID, HUNGER AND CONSERVATION

[Written questions and answers]

A Critique of Technical Aid Programs

Chall: During your work as a consultant to foreign nations, I'm sure you saw a variety of American and international aid programs, both private and public. Do you have any opinions about their general direction and personnel? Would you be willing to compare any?

WCL: In our discussion on the work of the U.S. technical assistance and the F.A.O. work with Israeli counterparts, I told of the recognition that was given the F.A.O. as accomplishing much more than any other agency. In my opinion, this was due to our close association in offices and in the field. We were not sitting in an office, telling the Israelis what to do, but we were examining all phases of their problems with our counterparts and the farmers out in the field.

This, I believe, is the reason for the widely recognized success of Israel's technical assistance programs in lesser developed nations. I recently heard a lecturer at the University of California state that in Latin America, Israel's technical assistance was by far the most successful of all that was being done. For they work as a team out on the job with the local counterparts and the local people.

Of course, the United Nations, including UNESCO, the F.A.O. and other branches, as well as certain nations giving technical assistance, are all working for a better way of life for people in the lesser developed parts of the world, but some with more success than others.

Chall: Do you see any merit to the idea posed by some, that foreign aid should be sponsored primarily through various agencies of the United Nations, with "have" nations contributing some portion of their gross national product to finance these projects?

WCL: Of course, these new countries need financial assistance from affluent nations, but this help I feel should not be given without approval of high U.N. authority, such as the Technical Assistance Board. Strict accountability must be given for the use of funds donated by any country or by the United Nations, to see that funds are used for the useful purposes for which they are

WCL: given.

One of the biggest problems of being effective in helping people in less developed countries is that one has so little to start with. For instance, one cannot go to a bank and borrow enough money to launch a considerable project.

Furthermore, there would not be the trained personnel to make use of the tractors, farm machinery and other mechanized equipment, or men trained to repair them. There have already been millions of dollars worth of mechanized equipment rusting unused in fields. Roads have been built that go nowhere and factories built where there were not the raw materials to process.

Now the U.N. has set up a Technical Assistance Board (T.A.B.) to go over all projects to see that they are practical before approval is given.

It is surprising to realize that in the United Nations, about sixty-nine of these new nations do not have a population as large as the city of New York, some with less than one million. They have, however, an equal vote with the most populous and advanced nations, but are as yet unable to contribute anything financially to the United Nations.

This inequality is a terrific burden on the "have" nations. These lesser developed nations want all the benefits and privileges of advanced and progressive nations to be given them without having to work for these good things of life as we have done. Further, more than twenty-five of these nations had a per capita annual income of less than $100.

American Aid

Chall: In your opinion, can the United States continue to take the lead in feeding the hungry of the world?

WCL: I read recently in the paper that we are giving another million tons of grain to India. Yet people are increasing so rapidly that all such gifts are soon nullified. We are told that a fourth of the grain is eaten by rats which overrun the country but cannot be killed for religious reasons. Neither can the millions of half starved sacred cows be used for food, but use up land and food that would feed several million native people.

I believe the people of the United States have no concept of the enormous volume of foodstuffs that we have given to Egypt,

WCL: Yugoslavia, Morocco, India, Algeria, Arab nations of Africa and the Middle East, and countries of South America and Southeast Asia. And of course, we are feeding millions now in South Vietnam.

This attempt to feed the world cannot continue for long. Our own population is growing with increasing demands while we annually cover over millions of acres of our best food growing lands around cities with cement for great freeways or for huge supermarkets, outdoor movies and vast urban sprawl--the megalopolis which we see along our eastern and western shores.

So while we still have abundance and to spare, we should use our know-how, our experience in modern food growing techniques, and give financial aid with intelligence to help these underdeveloped nations grow their own food. We should provide family planning instructions and techniques to keep populations in line with ability to grow food, for there is nothing worse than famine and starvation to limit populations.

Food and Famine

Chall: More than a decade ago you said that mankind was running a race with famine and the outcome was still in doubt. Is this also true now?

WCL: Yes. The United Nations tells us that food is increasing on the average around the world at the rate of two and a half percent a year, while population is increasing at the rate of three percent a year. This indicates that at this rate, famine is winning in this race.

Chall: Is there enough agricultural potential in the world to feed all the people who will inhabit it in the near future? How do we bring food production into balance with population?

WCL: I believe that potentially the earth's resources could feed double the present world population if all countries, by science and technology and modern farming methods, brought their lands into maximum production.

As I have mentioned previously, the vast peat swamps of the upper Nile in the Sudan, if drained and properly farmed, would feed thirty or forty million people. And Iraq, that great unused bread basket that formerly supported in ancient times at least

WCL: thirty to forty million, with only eight and a third million today, could be made to support fifty million today with a higher standard of living by judicious use of irrigation and fertilizers. All around the world are enormous opportunities for increased production of food, if modern science and technology are made use of.

Practically all the best lands have been occupied, so increases in population must be fed by development of under-used land and water resources. Such nations as the United States, England, Israel and some others have demonstrated how lands can be made to increase productions several fold. But food and population can never come in balance today without drastic measures to curb human fertility. A thorough study of the whole situation is called for.

Chall: For many years you have written on famines and that hungry people contribute to instability among nations of the world. You've seen how peace and stability were teetering in the balance, and there still is no peace. I suppose this is difficult for you and Mrs. Lowdermilk to accept, when both of you have done much to try to bring about peaceful solutions to basic problems which beset mankind.

WCL: Yes, but it is gratifying that nations, government officials, people and farmers are awakening and recognizing these things that we have been talking about. The U.N. Food and Agriculture Organization has put on a campaign of "Freedom from Hunger," which is doing its utmost to stave off the terrible consequences, now looming on the horizon, of civilization losing the race with famine.

Instability in the World

WCL: The other day, my wife and I were thinking back over the forty countries in which we had traveled, to see if there were any that would be enjoyable to return to again for travel about the country. It was sad to realize that many of the countries were now involved in civil war, or inter-racial strife, or were anti-white or anti-United States, or were behind Communist iron or bamboo curtains. In all of these countries, travel would be unpleasant, impossible or dangerous. Only in nations of Western Europe, or in England, Israel or Japan, would we find ourselves safe and welcome and able to travel about freely.

It does seem that the nations of this world are finding it more and more difficult to live together under the same roof with their increasing populations and decreasing food supplies. The fact that there are so many new, underdeveloped nations which

WCL: have gained political independence before economic security probably is back of much of this instability.

Philosophy on Conservation

Chall: Dr. Lowdermilk, you have been spoken of as the philosopher of conservation. Will you give us some of your personal thoughts or conclusions?

WCL: Well, for more than fifty years, my profession has been to read the records that farmers, nations, and civilizations have written in their lands. I have wanted to find the basis for a lasting and righteous adjustment of human populations to the earth. For until such an adjustment can be found, there is no hope of peace on earth or good will among men.

These travels have taken me across six of the seven seas to study land use in thirty-seven countries on four continents. I have also had a bird's eye view of eleven other countries in aerial flights to and from China in long round about travel. Surveys of land use have taken me into those regions where civilizations first arose in the Near East and in the Far East.

Man Ruins His Land

WCL: What do we find? Where man has lived longest in organized societies, there, with few exceptions, lands are in worst condition. The cradles of civilization are in decline; ruins of great works bespeak former wealth and splendor amidst modern decadence and poverty. Evolution of civilization appears to have gone in reverse. For it is chiefly in the newer lands, such as Western Europe and more especially in the Americas, occupied in comparatively recent times, that people enjoy a greater abundance.

I think I should also include the new State of Israel, which in a comparatively few years has transformed a desolate man-made desert--by hard work, technology and scientific farming--and has become the pilot project for emerging nations on reclamation of land.

But civilization is not yet a success. Of this, World War II is a costly proof as is also the hundreds of billions of

WCL: dollars that nations are spending in armaments against their neighbors, for in our small world today, every nation is our neighbor, easily reached by modern weapons of warfare. As I have looked upon ruins of old lands and depressing poverty and backwardness of their peoples, I have been deeply moved by the wastefulness and ineffable sadness of man's failure to adjust himself to the bountifulness of the good earth.

In ignorance and wastefulness, mankind has stridden across the face of the earth for seven thousand years, reaping more than he has planted and destroying what he has not made. Fields have been wasted and grasslands shorn bare, forests have been despoiled of their capacity for sustained yield, and flood waters have increased their ravages.

In occupying new lands, man has skimmed off the "cream" and left "thin milk" for the generations to come. Man tends to destroy the source of his existence. This type of land use is self-limiting and suicidal. Wars and conflicts have arisen out of privations and fear of privations brought on by wasteful use of land.

The children of men found the earth literally a Garden of Eden. But after seven thousand years of increasing command over tools and powered machines, civilization is on trial for its wastefulness of land and conflicts rising out of it. Thus we have no guarantee that civilization will long endure. Depletion of earth's resources and the on-rushing population explosion can bring on the suicide of civilization without the hydrogen bomb.

But it is not for this extinction that man has been struggling forward into the unknown for seventy centuries, but toward a more abundant life. If civilization is to endure, society must be born again, out of an economy of wasteful exploitation into an economy of conservation. "Where there is no vision the people perish."

The world today is more fully occupied by the human race than ever before. All lands have been possessed by nations. No free land remains. There are no new continents to discover, to explore and to exploit, except to make full use of foodstuffs available to man in the oceans and inland lakes and rivers. Mankind is left to work out its salvation on lands now occupied.

Land Use to Feed Billions

WCL: Of the total area of the earth, about 3,700,000,000 acres are

WCL: reported under cultivation and support the present population of about three and a half billion souls. This allows but 1.06 acres to feed each person. Demographers tell us that in another thirty-three years by the end of the century, there will be seven billion people on this planet. These are not mere statistics, but are individual human beings who will be our children's children and must have food, clothing, housing, jobs and services of all kinds.

We estimate that only eight to eleven percent of cultivatable lands may be increased at great expense by draining swamps in the tropics or irrigating dry lands. So with these added lands under production, each human being will have to be supported on 0.5 acres. This does not take into consideration the hundreds of millions of acres of good farm lands around cities that are going into freeways, supermarkets, housing tracts and megalopolis that cover food growing lands with concrete and houses.

For years I have been saying that Civilization is running a race with famine and the outcome is very much in doubt. This doubt is due not so much to shortages in resources of the good earth, plundered as are some and unused as are others, but to the lag in the take-up of modern ways of farming. In my opinion, our planet could feed, on a higher standard than that of today, twice the present population, if all earth's resources were fully developed and used with scientific conservation methods.

The earth in its bountifulness is the silent partner in the rise and fall of peoples and civilizations. It richly rewards the diligent and understanding. In due time, it brings a curse of poverty and decadence upon those who neglect and waste its substance.

An ancient law giver warned of "visiting the sins of the fathers upon the children unto the third and fourth generation." But in the wastage of earth's resources, the sins of exploitation and wastage are visited upon the children for many times three and four generations.

The partnership of land and farmer is the rock foundation of our complex social structure, that makes possible high standards of living, cultural and recreational opportunities. "Man shall not live by bread alone," but he must have bread to live and to take part in other advantages.

There is no Substitute for Food

WCL: In the last reckoning, all things are purchased with food. This I learned in China when on a famine prevention program. People

WCL: sell their liberty, their all, for food when driven to extremes in this tragic choice. When food fails, all else fails--civilization falls apart. There is no substitute for food. A starving farmer will eat his seed grain. Hungry people will not keep their treaties, neither will they stay within their own borders. Privations and fear of privations cause peoples to follow ambitious leaders into aggression and war.

Moreover, our very civilization is bought with food. Money is only a convenience, a medium of exchange. Food buys our clothing and shelter, our cultural advantages and satisfactions, our advance in science, our industrial achievements as a nation as well as the billions spent in defense and foreign aid. For it is not until farmers grow more food than they need for their own families that other people are released for other tasks such as industry, transportation and services. All our achievements at home and abroad are made possible by the efficiency of our farmers.

Land with its crops, therefore, is more than an economic commodity; it is an integral part of the nation, even as its people are. We express our obligations to posterity as surely through the condition of our lands as we leave them for succeeding generations through our social institutions. Fertile or sterile lands that are passed on to feed future generations are, apart from blood descendants, our most direct link with the future.

Only by use with conservation in the fullest sense of the basic resources of land, water and the spirit of people, can we maintain the human values of wholesome standards of living with abundance, opportunity, freedom, justice, and faith in the destiny of our civilization.

Only in such conservation have we the assurance of continued progress in the search for that something which has led humanity out of the stone age into an industrialized age in which powered machinery gives marvelous efficiency to all divisions of labor.

Only by conservation of all our natural and human resources can we be led on to higher economic, physical, and spiritual development which expresses itself in stewardship of the earth for the well-being of the individual, the state and the survival of civilization.

Conclusions About Conservation

WCL: After making studies in some fifteen countries of Africa, I was at Lake Victoria, awaiting my plane back to the United States. My findings seemed to crystallize into five theses that I felt should be nailed to every government capitol, every church door, on the entrance to every school and every university.

1. A government policy to endure must also provide for and bring about full use with conservation of lands and waters of the country.

2. Agricultural development to safeguard the food supply of a country must discover, plan and carry out full use with conservation of its lands and waters.

3. A country-wide economic program, to be sound, must include and be founded on full use with conservation of the land base.

4. An educational system, to meet the basic needs of a people, must instruct in and demonstrate full use with conservation of lands and waters of the country.

5. A religion or interpretation of Christianity, to be adequate to highest development of a people in matters of the spirit, character and industry, must sanction, support and foster full use with conservation of lands and waters of the good earth.

My conclusions are that the best measure of a human culture is the status and condition of use of the land base on which it is built. I use the condition of the earth or land base as the measure, rather than the condition of the people.

In California, the idea of beneficial use of water is established; otherwise, a man forfeits his right to the use of the water. The idea of beneficial use of land is also a moral right to land, and will in time become the legal right. The only legal basis for our having taken America away from the Indians is on the principle of beneficial use of land.

For the realization of our objectives, we must give play to individual initiative within the framework of social objectives arrived at by the democratic process.

The Creator must expect man to be intelligent to work in his own interests, otherwise he would have endowed man with an instinctive knowledge of all the mysteries of the Universe. This he certainly has not done, but permits man to enjoy the thrill of

WCL: discovery after discovery, the unraveling of mystery after mystery and the understanding of miracle after miracle and the achievement of synthesis after synthesis of the multifarious forces and materials of the earth.

Man's conquest of the universe, to redeem and replenish its resources and accept and pursue this tremendous challenge of working out a righteous adjustment of billions of humans to the earth in all its gigantic and yet partially known possibilities, will be man's greatest challenge and achievement.

XVIII INTO THE PRESENT, 1957-1968

[Written questions and answers]

Chall: You retired from the Department of Agriculture at sixty and from your overseas consultant work at seventy. It would be interesting to know what you have done in these retirement years from seventy to eighty-one.

WCL: Well, I certainly would say these eleven years have been anything but retirement. I have written many articles and chapters for a number of books. But this was also a time when I tried to do technical assistance for my own country and neighbors. This proved to be harder than my work overseas and was done without emoluments of any kind.

Chall: Where did you do this work and why?

WCL: In the 1940's, cities became concerned about atomic warfare and plans were made to at least partially evacuate congested areas. Elliot Roosevelt, then mayor of Los Angeles, enthusiastically backed this plan. At that time there was much public domain or government-owned desert land in southern California. The land office surveyed large areas of desert into five acre tracts, to be homesteaded. Deeds were given within three years if a house of certain specifications was constructed and a payment of twenty dollars per acre paid to the government land office.

Moving to Morongo Valley

WCL: Our son was among the tens of thousands who took up five acres, and in 1950 built a small house which we used. My wife's two sisters took up adjoining five acre parcels. When each had "proved up" and received deeds, we bought the two sisters' places and added on to the original structures to make really beautiful desert homes. This we did after I returned from Israel.

Of course, we planned to make Berkeley our permanent retirement home, but we also wanted a desert hideaway and built one adjoining house to rent. Apparently we had a pioneering work to do in this valley.

Chall: Where was this desert place located?

WCL: It was in Morongo Valley, at an elevation of three thousand feet near Yucca Valley and now about a twenty minute drive from Palm Springs. Here the desert vegetation is beautiful. The land lies on the southern flanks of Mt. Gorgonia and has a magnificent view of Mt. San Jacinto.

Locating Water

Chall: What pioneering work did you find to do there?

WCL: I did not find it--but it found me, and covered several fields of endeavor. All the five acre homesteaders in our northeastern part of the valley had to haul water themselves or pay $8.30 for each one thousand gallons hauled by tank truck to them. When the local people heard I was a hydrologist, among other things, the impression seemed to be that of course I would find them water.

As time went on, pressure on me to get water mounted. I did not do the proverbial "water witching," but spent much time studying the geology of the area from a hill above us at the mouth of Little Morongo Canyon, on whose outwash fan we lived.

Chall: How could you locate underground water from the top of a hill?

WCL: It was evident to all that present surface flood waters flowed west of the hill, and one would assume that the underground stream would be there also. But as I pondered, I found geologic evidence that formerly the stream must have flowed to the east of the hill, and the surface had been covered over and pushed west by an outwash fan from another nearby canyon.

If this was true, then the ancient underground drainage for our big canyon would flow to the east of the hill. If this was so, then a well on the corner of our lower five acres should hit the ancient underground stream.

Chall: Did you act on this supposition?

WCL: Yes, but I had some trepidation about it. To put a well on an outwash fan with huge boulders would be an expensive operation for us to finance. The well digger and I estimated a depth of 185 feet to reach water, according to water levels in wells at the lower side of the valley.

Digging the well was a desperate experience for us. At

WCL: two hundred feet there was no water. At 250 feet we still had a dry hole and our contract with the well digger ran out. At three hundred feet there were only dry boulders. From 250 feet on, we were paying $67 a day for the well digger and rig. It was agony when ten days were required to pound through one fourteen foot boulder. We had been digging for almost four months, into a dry hole.

Suddenly, the drill burst through a huge boulder and upward gushed water twenty feet into the well and remained stationary. My geology had been correct. We had struck the old underground stream and semi-artesian water had risen under pressure. We continued to dig for another thirty feet or so into the underground aquifer or lake.

We installed a twenty horsepower pump which the California Water Company used to test the well for us. They conceded we had more water than the twenty horsepower pump could deliver. At 150 gallons per person per day, the test proved that we had sufficient good water to supply the daily needs of nine hundred people.

Financing the Water

Chall: You must have been very relieved and happy.

WCL: Yes, immensely so, but our problems were not over. We had to find a way to set up a water company within the costs of what homestead owners could pay, for many were pensioners. We repeatedly gathered all land owners to our home, including nearby absentee owners, to discuss all possibilities.

We finally found a government financing organization: the Federal Housing Administration was authorized by Congress to give government loans to put water on non-agricultural lands in rural communities. We were able to get a $40,000 long time loan at low interest rates.

Our neighbors, the Veits, had a son, Mr. Gamble, who was a prominent water lawyer in Los Angeles, and he donated his services to work out articles and by-laws for our organization. These were so satisfactory that the F.H.A. requested to use them as the model for future similar loans throughout the country.

The original members thus got water delivered to their five acre tracts for a cost of about $150 per member. Each paid for pipes from the streets to the houses. Fire hydrants were placed every six hundred feet, and that greatly reduced our insurance costs. Then for a cost of nine dollars per month, each member

Morongo Monograph

When Morongo Valley Community Services District turned down Feather River water last month, it did so only after a thorough study of the potential water resources of the valley based on a report by Dr. Walter C. Lowdermilk, one of the world's leading authorities of soil and water resources, and a resident of Morongo Valley. This recent report was in response to the Water Resources Department of the State of California for a study of the future needs of Morongo Valley. The estimates of water resources available to the gateway to the high desert were obtained by a study of the watersheds of Big Morongo and Little Morongo Canyons above the 4000 foot contour which reaches to heights of 9000 feet towering 11,502 feet in altitude.

The report states that "estimated annual replacements of waters through this study indicates that local water supplies of Morongo Valley and its catchment area in the high mountains up to 9000 feet will be sufficient to supply 150 gallons per day per person up to about 24,000 persons, if economic development grows accordingly. In view of these findings, it seems unnecessary to apply for Feather River water up to the year 2000!" (recorded at Berkeley, Feb. 3, 1964).

While the above summary barely hints at a fascinating story which is probably unique in geographical statistics, it does serve to introduce a practical application of Dr. Lowdermilk's findings in his own back yard! Applying the acid test to his scientific theories at his home in Little Morongo Heights, the doctor brought in a well whose capacity equals in quantity what his comprehensive report reveals in future water potentials for Morongo Valley.

While pumping 100 gallons per minute for 24 hours, the Lowdermilk well is subjected to a drawdown of only four feet in approximately 70 feet of water. Some 42 resident water-haulers in Little Morongo Heights became highly conscious of this high producer when Dr. Lowdermilk relinquished all rights to the well and handed over the pink slip to a group of local citizens, subsequently to be known as the Little Morongo Heights Water Assn., Inc.

Board of Directors

This act turned into fact what had hitherto been but a faraway dream, and on February 8, 1964, the board of directors, consisting of Grace Veit, president; H. Douglas Gamble, vice president and legal counsel; Dr. Grace Munson, secretary-treasurer; Dean Driscoll, Frank B. Knudsen and Walter C. Lowdermilk, directors, celebrated the occasion at the first annual membership meeting.

Having become assured of the stability of the Lowdermilk well through further official hydrostatic testing by the California Electric Power Co., a loan was established through the Farmer's Home Administration (F H A) which would enable the Little Morongo Heights Water Assn. to purchase the well, install a storage tank, and construct a pipe line distribution system to provide domestic water and fire protection for approximately 42 share-holders of the Little Morongo Heights area. Project Engineer, Mr. L. A. Hosegood, general manager and chief engineer of the Municipal Water Department of San Bernardino, personally surveyed the land and drew up the area maps and specifications. On April 22, 1964, the firm of Hicks & Allred, general engineering contractors of Cathedral City, having submitted the lowest bid, began moving heavy equipment into the area, and during approximately 33 working days constructed a 36,500 gallon steel storage tank, dug just over three miles of trench in some of the rockiest terrain encountered this side of the Rockies. They laid better than 16,000 feet of six inch pipe mains five feet deep, with four inch side laterals, all hand welded seams, set up 22 fire hydrants and installed 42 meters.

Determination

Covering a period of two years and one month, the successful completion of the distribution system is the result of an unflagging determination on the part of a handful of responsible citizens to see an idea through to its ultimate conclusion. Responsible in no small way for the success of the water project, Gamble, an attorney, prepared the legal papers, and drafted the constitution and by-laws.

While the high-producing well that makes this story possible is no more phenomenal than the famous scientist who brought it in, it does serve to point out a modern-day miracle; the possibility of individual accomplishment the American way. Any group of responsible citizens with enough determination and imagination can do the same thing through FHA.

There are indeed few ways in which the sense of complete residence can be realized without water; the miracle here lies in the transformation of a group of water-haulers into a modern community with an abundance of water under the authority of the Little Morongo Heights Water Assn., Inc. —e.c.p.

HI-DESERT STAR—
Thursday, June 4, 1964

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WCL: had five thousand gallons of water for four dollars, and a limitless additional supply for fifty cents per one thousand gallons. The five dollars applied toward repayment of the government loan.

Some fifty householders are using our well water. Payments and expenses are easily met and good financial reserves are being built up. When paid for, the water will belong to the shareholders. Now in our area, all old timers and newcomers have all the good water they can use.

Leaving Morongo

Chall: This must have raised the value of property for everyone.

WCL: Yes, but by the time the financial strain and the frustrations of organizing the well and water company were over, we were restless to move permanently to Berkeley. The director of F.H.A. had laughingly said that experience elsewhere showed that when an individual put in a well and worked out a water company, then it was best for that person to leave town.

We had spent much of our own funds, besides donating the land on which the well was located; but there were jealousies, and some people said we were getting rich on the deal and that we had only put in the well to get prestige in the community and the like. So we decided to leave Morongo and make Berkeley our year round home.

Rejection of Feather River Water

Chall: But you mentioned there were several other things which you seemed destined to do for the valley, and which, I presume, you did before you moved to Berkeley. What were they?

WCL: The Feather River Water Project, to bring water to southern California, required communities to sign up for it and begin paying assessments at once, even though the Feather River Water Project would not be delivering water until about 1990.

There was a clamor among some in the valley to sign up for this expensive proposition along with other neighboring towns. In my report on my geologic survey of the valley, I showed that Morongo Valley had an annual renewable water supply, more than could be used by any forseeable population that could settle in the valley which was only eight miles long and two and a half

WCL: miles wide.

Morongo Valley is faulted down like a huge bathtub. Waters flowing down Big Morongo and Little Morongo canyons flow into this tub-like lake, and rise to the surface on the lower side, forming several small lakes that overflow and disappear into Big and Little Morongo canyons that are broken by this rift fault in the Little San Bernardino mountains.

Chall: How did you make this geologic survey?

WCL: Rain and snow melt from Mt. Gorgonia's massive eleven thousand foot height, on our side of the valley, had to flow down Big and Little Morongo canyons. These extend high up on the peak. I excluded all rainfall in the valley up to four thousand feet on Mt. Gorgonia. Then I secured rainfall and snow melt records for the past fifty years from the Geological Survey in Los Angeles to get the average rainfall to be expected over a period of fifty years.

I then computed that if only ten percent of rain and snow melt above the four thousand foot level to the eleven thousand foot peak, flowed down, either on the surface or largely underground, then we could consider our valley was blessed with self renewing annual water to provide a permanent supply for maximum non-agricultural development for years to come. Our well demonstrated the renewable features, for after five years of pumping for fifty families, the water in our well stands four feet higher than when we began to pump, because of heavy snow melt last year. There was no need for Feather River water in Morongo Valley.

But the valley had many factions and verbal fights. Some wanted to accept my report and not vote for the Feather River Water Project. A few were vehement to do it. This latter group, in a small area of the valley, are now paying heavy assessments and will continue a long time to come, though they have an abundance of water underground in annual replacement as I described.

But the majority of land owners rejoice in the assurance they have an abundant supply of good water here in the desert at very little annual cost and are spared the heavy assessments. Recently, the residents of Big Morongo outwash fan have carried out our procedures and have received a government loan and soon will have their own water district.

Development of the Property Owner's Association

Chall: Then you have the satisfaction of knowing you saved the majority of taxpayers these large amounts in high annual assessments.

Chall: What were the other things you did?

WCL: As I said, the residents of the valley had a reputation for being scrappy and divided into factions. Little could be accomplished, for each side feared the other would gain control. The Chamber of Commerce was in a mess, so I suggested that property owners form a Property Owner's Association. The Chamber of Commerce wanted to be in control and called for a public meeting.

After considerable discussion, it was decided to elect a temporary chairman to organize and develop by-laws. Immediately the wife of a professor from Cal Tech, Mrs. Thompson, who had a part time desert home as we did, rose and nominated Lowdermilk, a newcomer to the valley who had been with the United Nations. Another member instantly seconded the motion.

There was a moment of consternation. Discussion was called for, but no one knew what to say. The vote was completed, but all around, one could hear the question buzzing, "Who's Lowdermilk? Who's Lowdermilk?"

I was called to the front to take the chair and lead the proceedings. Most people were stunned and speechless. I assured them that all proceedings would be followed in a democratic manner and asked for their written suggestions. I promised that everyone would be given copies of all proposed developments a month in advance, each item would be discussed, and after discussion, final decisions would be made by majority vote--which is the American way of doing things. They seemed reassured and accepted me.

Chall: Did the Property Owner's Association work out as you hoped?

WCL: Yes, it surpassed my hopes. Membership grew to more than three hundred the first year, and later rose to four hundred, including out-of-towners who liked to get our monthly bulletin.

We had monthly meetings, good speakers and always delicious refreshments and a social time, with a big annual festival in the park, which was donated to the valley by the Covingtons. So this feature of our stay in the valley had a happy beginning and has continued so. My year as president of the Property Owner's Association was one of splendid esprit de corps and much progress.

Writing the Chamber of Commerce By-laws

Chall: You must have found much satisfaction in bringing this degree of harmony where there had been friction. Did you have any other public activities while living there?

WCL: Well, perhaps I should mention one other thing which required a lot of time and work. I mentioned that the Chamber of Commerce was in confusion. Actually, it was operating illegally and had no satisfactory by-laws. This had been turned over to a committee several years before, but little was done. I fear that a few members rigged a particular meeting. Quite a number of members had let their dues lapse in the Chamber of Commerce. Suddenly they decided to pay up and attend.

The question of by-laws was brought up. Quickly one member rose and made a motion that all former work on the by-laws be given to Lowdermilk to work over and thus make the Chamber of Commerce legally operational. Instantly another one seconded the motion, and while some old timers resented this, there was nothing they could do on the spur of the moment.

I was house-bound with bronchitis for several weeks but devoted my entire time to this task and had the excellent talents and assistance of Commander Jones, U.S. Navy, retired. When completed, each section of the by-laws was sent a month in advance of the meeting to each member; then each section was publicly read aloud, discussed and voted upon. Since then the Chamber of Commerce has been a highly respected and active part of the community and has done much to promote progress in the valley.

Other Activities in Morongo

Chall: Well, you seem to have done some important pioneering work in Morongo Valley, and you must find it satisfying to look back upon these years of so-called retirement at the desert.

WCL: Yes, we go back frequently for brief visits and keep our desert home there, though it is now rented. I have told how I was kept busy; but I should say that my wife too was very active in all endeavors for the valley, and she also worked with me, acting as my secretary and typing the many articles and chapters for books which were requested and which I wrote during this period at the desert. Besides, I did some carpenter work on our houses, so actually this period was one of the busy times of my life.

Life in Berkeley

Chall: Apparently, you spent about five years at the desert and six

July 2, 1967 Oakland Tribune



HONORED AT 80—Dr. Walter C. Lowdermilk (left), a leading authority on soil and water resources, receives an award from Israel at a Saturday luncheon in Berkeley, held to honor his 80th birthday by his scientific colleagues. Gideon Saguy, Israeli consul-general in San Francisco, (right) presents the award, watched by Dr. Samuel Lepkovsky, a U.C. professor of nutrition. Dr. Lowdermilk, after he retired as chief of the U.S. Soil Conservation Service, spent from 1951 to 1957 in Israel as U.N. soil and water consultant



A reception to greet the new Israel Consul General, David Ben-Dov (far right) was held at the home of Prof. and Mrs. Walter C. Lowdermilk in Berkeley. Shown here are (standing left to right) Dr. Daniel K. Oxman, Prof. Lowdermilk, Joseph Saphir, the outgoing Consul Gideon Saguy, and Consul Ben-Dov. With them (seated left to right) are Mrs. Ben-Dov, Mrs. Saphir, Mrs. Lowdermilk, and Mrs. Saguy.



DR. AND MRS. WALTER LOWDERMILK
Berkeley couple were honored by Hadassah at a regional convention.

Chall: years of the past eleven in Berkeley?

WCL: Yes. We moved to Berkeley shortly after the well and water company were completed, and here again, life opened up for us in unexpected and satisfying ways. Immediately, the Geography Department of the University appointed me as Research Associate without emoluments, and this gave both my wife and me all the advantages of being a member of the faculty. I attend the weekly seminars and take part in them. We also enjoy the many dinners and parties given by the Geography Department.

Chall: Then you did not return to Berkeley as a total stranger after your many years of work elsewhere?

WCL: Oh no, for I had numbers of old friends and colleagues here. There were the Forest Service friends, dating from the time I worked here in the Forest Experiment Station. Then there were the Soil Conservation Service friends, some of whom I had known since I organized the conservation work in the western states when I was Assistant Chief of the Soil Conservation Service, for fifteen years.

Another pleasure here is that Berkeley is the crossroads of international travel, and many friends throughout the United States and abroad visit us and renew friendships.

Consultant in the Redwoods

WCL: As you may remember, my first love was forestry. Now in my retirement in Berkeley, I have returned to my first love. My long time friends, Ralph Chaney, who is President of the Save-the-Redwoods League, and Newton Drury, who is the Executive Director and Secretary, have their headquarters here.

After the 1956 floods in Humboldt County, more than five hundred of the giant old redwoods were undermined and toppled. Bull Creek Flat was seriously affected. This is the finest of all redwood forests and was donated by and named The Rockefeller Grove.

Both Chaney and Drury knew that much of my life had been devoted to studying erosion and methods of control, and I was asked to study the Rockefeller forest and suggest measures to prevent a recurrence of such severe losses during heavy rains.

WCL: After I submitted my report, I was asked to continue as a consultant to the Save-the-Redwoods League, and annually I make several trips to see how remedial work is progressing. But details of this I shall discuss with you next time you come to tape.

Oral History

WCL: One of the finest things that ever happened to me, and certainly a bonus to me during these sunset years, is that the experiences of my long and full life, which otherwise would never have been completely recorded, are now being written down. For this, we thank the University of California Bancroft Library and the Water Resources Center of the University of California at Los Angeles, whose financing made possible this publication.* I am deeply grateful.

The Lowdermilk Family

Chall: Before we close this last interview, I want to ask about your children. You dedicated this recital of your activities in many countries to your wife, who has been your constant and helpful companion, and to your exceptionally fine son and daughter. Did you find it difficult to be parents and still do so much traveling?

WCL: We began taking the children with us when they were babies, and they grew up with the idea that I had my work to do and they must adjust to our travels. They willingly cooperated and were happy on the many trips we made from our Berkeley home to my headquarters at the California Forest Experiment Station and to my field work headquarters at Bass Lake and San Dimas. When I was transferred to Washington, D.C., we drove many times back and forth across the United States. We tried to show the children most of the famous places and national beauty spots.

The crowning trip was in 1938-39, when we shipped our car, and the family spent a year and a half of continuous travel while I was making studies in Europe, North Africa and the Middle East.

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*See Preface for additional information on funding.

WCL: Friends were shocked that we would take the children out of school for so long. But they gained so much, each skipped a grade because of the travels.

Both our son and daughter grew up to be self-reliant, capable and contributing citizens in whom we have much justifiable pride. They have carved out for themselves careers of distinction in their chosen fields. Our son, whom we call Skip, graduated from U.S.C. and went to Iran under our State Department Technical Assistance program, and there he married his lovely wife, Ina. He also worked in Israel, Thailand, and Saigon, and briefly in the Sudan. Now after fifteen years, he is in the State Department in Washington, D.C.

Our daughter, Winifred Esther, whom we call Westher, graduated from the University of California at Berkeley, majoring in geography, and was secretary for several years to Professor Carl Sauer, head of the geography department. Her husband, Wilmot Hess, affectionately called Bill, was a brilliant student who has his doctorate in nuclear physics. After graduation he became a leader in space sciences and won the Arthur S. Fleming Award for outstanding achievements. Westher has proved to be an exceptionally efficient and capable helpmate to her V.I.P. husband.

We take great pride in our son and daughter and our five promising grandchildren, Sharon and Karen Lowdermilk and Walter, Alison, and Carl Hess.

INTO THE PRESENT, 1957-1968

[Taped questions and answers]

Consultant to the Save-the-Redwoods League

Chall: I understand from my conversation with Newton Drury that the Save-the-Redwoods League was very appreciative of your consultant work with them and with the State Parks at Sacramento. How did you happen to get into this work?

WCL: When in Israel, I had heard of the disastrous floods in the redwoods that had toppled more than five hundred of these ancient giants in the floods of 1955-56. So when I returned to Berkeley and saw my old friends, Ralph Chaney, President, and Newton Drury, Executive Secretary, of the Save-the-Redwoods League, my first questions naturally were about the status of the redwoods in the Rockefeller forest in Bull Creek Flat and what was being done to prevent another such disaster.

I have always been especially interested in this Bull Creek basin with its magnificent stand of giant redwood trees. These are truly our most honored senior citizens. Here, on about five square miles, or about 3,500 acres, is a rare climax stand of the most magnificent assembly of giant trees in the world. Often on a single acre there has grown in a thousand years a million board feet of the finest, clear redwood lumber.

This Rockefeller forest is one of the few groves that has escaped the ax of man and the covetous eyes of timber merchants. Lumbermen are rapidly cutting the redwood giants in the comparatively few remaining groves further to the north. The demand for this redwood lumber is increasing rapidly and prices are high.

These spectacular marvels of nature that have come to us out of the mists of the past are the priceless heritage of California and they attract tree lovers within the nation and around the world.

Chall: So when you found your favorite grove was in danger of further destruction, you wanted to do something about it?

WCL: Yes, I did, and I offered to go up to Humboldt County and look over the situation to see if I had learned anything in my past experiences that might be helpful. I was so eager, I remember

WCL: saying to my wife that I would be willing to work for nothing, just for the chance to help. However, I was always given a modest honorarium.

Bull Creek

Chall: Then you made a trip up to Bull Creek Flat immediately?

WCL: Yes, I did, and I spent several days in aerial observation flights and in ground studies on the flats, and especially in the watersheds above Bull Creek basin that had been cut over and burned over. These conditions had given rise to flood waters loaded with debris. Here I was in my element, for watershed studies and torrent control have been a part of my life for the past forty-five years.

I wrote quite a lengthy report on conditions that I found in the Bull Creek watershed and in this report made recommendations for measures to be taken.*

I found that in two of the watershed tributaries above Bull Creek Flat, both Cuneo Creek and Panther Creek, posed very critical problems. These steep slopes of seventy-five percent or more, that had been cut over and burned over and then had suffered the floods of 1955-1956 and again in 1964, were in readiness, if or when another heavy rainstorm should come, to set serious mud flows into action.

It required only a little undercutting of the steep slopes into the creek bottom, to set in movement slides on the slopes that would bring down vast amounts of mud and debris that would sweep all before it. These mud flows become terrifying menaces.

Furthermore, I found, literally, rivers of gravel, in position for immediate movement downstream in any serious flood. The stream bed through the Flat was already overloaded with gravel. Any additional amounts in quantity would cause the flood waters to overtop the banks of the creek and inundate the surrounding lands with infertile gravel that might kill the trees, as well as cause the stream to undercut and topple other giant trees, for they have very shallow roots for their great height.

I asked Mr. French, an "old timer" who knew the former stream bed very well, how deep he estimated these new gravel deposits to be. He said, "Fifteen to twenty feet," added into the stream bed. Gravel on Cuneo Creek had filled in and was

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*A Report to the Save-the-Redwoods League, 1961.

WCL: washing out again.

My concern was not only for these mighty living monuments of the past that also belong to the future, but I had a concern for the village of Bull Creek with its two sawmills, now little used, and the semi-ghost town of those who made their living by lumbering.

If the next big rainstorm should be heavy rains, there was a very good possibility that this village, its orchards and buildings, would be covered over by this rushing river of gravels. These people would be cut off from any road of escape, except to climb the steep slopes to the ridges.

So one of my first recommendations was that the Save-the-Redwoods League should buy up the entire watershed, so as to take all measures possible for controlling erosion and enable them to bring back the natural forest.

I also suggested that they buy the village, its orchards, its business buildings and sawmills, and remove the population, which they promptly did. There was little objection among the people. They received fair money for all their possessions, which was a blessing to them. Sure enough, in the next heavy rainstorm of 1964, the river of gravel came down and overwhelmed their homes and lands and left desolation where the village had been.

I was glad that my recommendation had been acted upon so promptly, for inhabitants had been evacuated without loss of life. For this, we can thank Ralph Chaney and Newton Drury, who raised the money to buy the village, as well as the entire watershed above Bull Creek Flat . Plans and works for erosion and torrent control and restoration of forest conditions by replanting are now being carried out.

Chall: Did you have any suggestions as to what could be done to protect the Rockefeller grove of giant trees on the Flat ?

WCL: Yes, I had much to recommend. Some suggestions could be acted upon at once; others would require time and money.

The Soil Conservation Service and the State Parks people had considered a dam to catch the gravels and raise the base level of stream erosion. This I heartily recommended and suggested that a revised study be made as to the practicality of the dam. But this would cost about six million dollars.

There was objection by some that no man-made structures should mar the natural beauty of the place. However, this would have been an earth fill dam on which plantings might be made to

WCL: provide natural beauty, as well as to give safety in flood control. Thus we would be able to absorb the gravel and mud flows for perhaps fifty years or so until we could bring back forests on the upland slopes.

Chall: Is this dam being built?

WCL: No, and there is apparently no hope that this will be done in the near future. For instead of more moneys being available for such public works, California is cutting down on all present projects for lack of funds.

Chall: What briefly are some of the suggestions or recommendations that you made for erosion control for the grove itself?

WCL: The first action to be taken without delay was to bulldoze and shape a deeper channel in the river of gravel that had filled the stream channel of Bull Creek. We said this channel should be straightened as much as possible to provide unrestricted flow of high stages of rainstorms in Bull Creek, and to move gravels downstream in the South Fork, of the Eel River.

This swifter current was designed to provide greater energy in excavating the moving gravels down the creek and out to the South Fork of the Eel River. Also gravel was to be bulldozed from the creek bed up onto the banks to serve also as revetments to keep the stream in its original channel.

All stumps, fallen trees and slash should be removed from the channel at the same time, for these cause the current to swirl. I suggested that this work begin downstream and work upstream into the river of gravel, which would then speed up storm waters, and to excavate and move gravels downstream.

I also suggested that a hydraulic model should be made to study how these flood flows react to the form and alignments of the new channels we were bulldozing out and thereby give us a basis for improvements in later works.

One thing I emphasized was that our works should not only provide protection for the giant trees, but that the stream bed itself was a scenic part of this wonder spot of California, and our measures should be carefully planned not to mar the beauty of the stream. Furthermore, I suggested that willows and alders be planted all along the banks, not only for beauty but to stabilize banks.

Chall: What measures did you suggest for controlling the stream in winter floods?

WCL: I already told of piling up the gravel against the banks of the

WCL: stream. But though we straightened out curves as much as possible, strong currents would sweep around even gentle curves and undercut banks and topple trees. In these bends of the creek, we piled up stones against the bank to serve as riprap to divert the force of the stream away from the banks. The stream bed is eight miles long through the Flat.

We tried out all our works on an intermediate three miles reach of the stream to test our measures. We found that our riprap worked successfully when the individual stones we used weighed about one thousand pounds each.

We found it was very important to find and to dig out old buried tree trunks in the stream bed; for strong currents inevitably find them, and then waters swirl about in the stream and cause currents to undercut the stream banks. Then this undercutting causes trees to topple over into the stream bed, and these in turn cause log jams and debris accumulations that in turn, cause more angry waters to dam up and to break through, and thus, out of control, cause disastrous results.

Preventing Flood Damage

Chall: Floods seem to be so unpredictable. How can designs be made to forestall the disaster of floods?

WCL: This is a question that engineers have worked on for many years. There are the usual winter rains, causing no damage. Then there are rainy years when saturated soils on slopes cause mudflows that are most difficult to handle or control. Heavier storms may come once in five or ten years and storms which we call fifty year storms.

On rare occasions there may be a storm and floods that only occur once in a century or even once in a thousand years, as the one that struck Humboldt County and the redwoods in the winter of 1955-56, when more than five hundred of our priceless giant redwood trees were toppled into the stream bed channel, to dam up water and debris and form log jams that eventually broke through, causing even greater damage.

Then, only eight years later, another thousand year storm struck the same area. Governor Brown declared that the counties of Humboldt, Shasta, Del Norte and Mendocino, were disaster areas. Railway, highway and freeway bridges were washed out, towns

WCL: obliterated. Rescue from all directions was impossible except by small planes that landed on strips of undamaged freeway and rescued many of the stranded local people as well as travelers. For anyone interested in this thousand year storm and what it did, he can look up issues in the Humboldt Standard newspaper of Eureka for December, 1964, to get a pictorial knowledge of the extensive damage to life and property.

Chall: What about the damage to Bull Creek Flat in this even heavier storm?

WCL: I am thankful to say that the various works we had put in on the stream bed, to hasten the waters and gravel more quickly through the Flat, reduced the serious damage of the 1955-56 winter floods.

It is most difficult to predict these huge storms. Even though considered storms that come once in five hundred or once in a thousand years, in this case they were separated by only a few years.

Man has not yet been able to fully cope with these huge storms. But the loss of life and livestock can be greatly minimized if river beds or river bottom lands are allowed to belong to the river which created them, and not have cities and expensive construction on them. Then when the river rampages over its flood plain, there is a minimum of damage to life and property.

These flood plains are fertile and should be utilized for growing needful crops or trees, but farm houses and towns should be built beyond the reach of unusual flood waters as took place in 1964. We call this flood plain zoning which must be an essential part of flood control on our streams.

Other Recommendations

WCL: I was well acquainted with the Los Angeles Flood Control District and their works. They had achieved remarkable successes in control, especially of mudflows that formed up in the steep mountains. When storm waters saturated the soils in the canyons, they set in motion mudflows that became very destructive. I wanted the young redwood engineers to see this work and discuss their experiences with the Los Angeles Flood Control District engineers.

I went down to Los Angeles ahead of time and made arrangements for the two groups to meet together at a field conference. we had two full days of continuous meetings in the field with an evening session. All were very pleased with the results.

WCL: The redwood engineers saw for the first time the successful use by the Los Angeles engineers of reinforced concrete cribbing (concrete blocks eight inches square and eight feet long). We decided to build our reef barrier of these reinforced concrete members which we had been studying. Ours was only a partial success in high flood stages, for these members were too light and when heavy tree stumps dashed against them, the upper ones broke.

Further research must be done, but funds for this purpose are not available. However, it is essential that stream channels be kept free of log and brush jams.

Chall: Just what was the purpose of these reef barriers and how did they work?

WCL: The reef barriers we set up became a base level that would cause the stones to keep piling up to the height of the crest of the reef barrier. Barriers backed up boulders a half mile, plus or minus, upstream, and by this method we stored up quantities of boulders and gravel in the stream bed. Then the crest of the wier behind the reef barrier would spread the flow of the stream across this flat crest. Then the water flowing over the crest would be free of debris, for all would lodge behind the crest.

Saving Ancient Trees

Chall: Well, now I understand about reef barriers and riprap.

WCL: Well, perhaps these are engineering terms and not clear to others. But I want to tell you of an interesting find we made. In one of the banks that had been undercut and was slipping into the stream, there was a Douglas fir tree, four feet in diameter, that was partly exposed. It was in unconsolidated sediments, in a deep deposit that had been covered over many feet. We suspected that it might be very old.

The superintendent, Herb Heinze, took a sample to a laboratory to have it dated. We were astonished to find it was 9,400 years old. This goes back to the ice age when water running off was greatly increased by melting ice sheets and at that time long ago, there apparently was also undercutting of banks that toppled trees.

Chall: It is fascinating to think of the ages of these redwood giants.

WCL: Yes, they are a priceless heritage, and that is the reason why it is criminal to cut these old giants. Of course, redwoods will grow again on these coastal areas which is their native habitat and climate. But these new trees will be allowed to grow only to an economic height for harvesting. Mankind will never again allow new trees to grow undisturbed for several thousand years just for beauty. So these climax stands should be preserved at all costs as a national heritage.

It is now a race between the lumbermen to cut as many of these big trees, with their tremendous volume of valuable lumber, and the many interested citizens who are pleading with the state and federal governments to buy up as many big trees as possible and include them in a national park where they would have perpetual care and protection.

It appears that now mounting deficits caused by vast war expenditures and pressure from lumbermen, have reduced the proposed National Redwood Park to a fraction of what was first planned and asked for. We can only hope that informed citizens throughout our land may yet save for future generations more of these priceless and irreplaceable treasures of the past.

APPENDIX

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PUBLICATIONS BY W. C. LOWDERMILK

Slash disposal in western white pine forests in Idaho	USDA Circ. No. 292. April 1924 20 pp.
Erosion and floods in the Yellow River watershed	Jour. Forestry, vol. 22, No. 6, pp. 11-18, May 1924
Factors affecting reproduction of Englemann spruce	Jour. Agri Res., vol. 30, No. 11 pp. 995-1009, June 1, 1925
A forester's search for forests in North China	Amer. Forests and Forest Life July 1925
Some practical possibilities in forestry for China	Jour. Assoc. Chinese and Amer. Engin., vol. 6, No. 4. 7 pp. 1925
The changing evaporation precipitation cycle of north China	Proc., The Engin. Soc. of China vol. 22, Paper No. 5 1925-1926
Forest destruction and slope denudation in the Province of Shansi	China Jour. Science & Arts, vol. 14, No. 3. pp. 127-135. Univ. Nanking Col. Agr. & For. bull. No. 11, March 1926
Factors influencing the surface run-off of rain waters	Proc. Third Pan-Pacific Science Cong. Tokyo. pp. 2122-2148. 1926
The Third Pan Pacific Science Congress under the auspices of the National Research Council of Japan	Proc. pp. 873-884. Nov. 1927
A method of rapid surveys of vegetation	Jour. Forestry, vol. 25, No. 2. pp. 161-185 1927
Erosion control in Japan	Oriental Engineer. March 1927
A cover and erosion survey of the Hwai River watershed: China	Nanking Univ. Manuscript in English Translated in Chinese. 1927
Torrent and erosion control in Japan. "To rule the river is to rule the mountain.	Amer. Forests & Forest Life. vol. 33, No. 404. pp. 474-479. Aug. 1927.
The forestry of Japan.	Jour. Forestry, vol. 25, No. 6. pp. 715-722. 1928.
The water cycle.	Jour. Forestry, vol. 26, pp. 332-354. 1928

Forest litter aids in conserving water for California farm	USDA Yearbook 1928. pp. 326-397
Erosion in the Orient as related to soil conservation in America	Jour. American Soc. of Agronomy. vol. 21, No. 4. April 1929
Further studies of factors affecting surficial runoff and erosion	Proc. International Congress of Forestry Experimental Stations. pp. 606-628. 1929
An analysis of factors affecting the yield of water from watersheds in Southern California	Mimeo. 1930
Forest and agricultural influences in streamflow and erosion control - summary review of literature up to 1930.	Mimeo. 1930
Influence of forest litter on runoff, percolation and erosion	Jour. Forestry, vol. 28, No. 4. April 1930
Forestry in denuded China	The Annals of Amer. Acad. of Polit. and Social Sci., vol. 152 Nov. 1930
Studies of factors affecting the yield of water from watersheds in Southern California	Proc. Conf. on res. problems in consumptive use of water and conservation of rainfall. Amer. Soc. of Civil Eng., Irrigation Div. Los Angeles, Calif. March 1930
Managing brush and forest primarily for yield of irrigation water	Proc. National Water Users Conf. San Francisco, Feb. 1931.
Studies of the role of forest vegetation in surficial runoff and soil erosion	Agr. Engin. vol. 12, No. 4 pp. 107-112. April 1931
A forester looks at China	Illus. Canadian Forest and Outdoors. vol. 28, No. 4. pp. 118-123,125 April 1932
Forests and streamflow; a discussion of the Hoyt-Troxall report	Jour. Forestry, vol. 31, No. 3 pp. 296-307. March 1933.
*Studies in the role of forest vegetation in erosion control and water conservation	Proc. of the Fifth Pacific Science Congress. 1933
Water conservation problem in forestry	Jour. Forestry, vol. 31, No. 2 pp. 185-188. February 1933

*Acceleration of erosion above geologic norms	Reprint from Trans. Amer. Geo. Union, 15th Annual Meeting 1934
*Coordinated uses of land on erosion control demonstration projects	SCS Mimeo. April 30, 1934
Forestry in soil conservation	Mimeo. Read at Knoxville, Tenn. May 29, 1934.
Permanent strip cropping	SCS Mimeo. June 10, 1934
*The role of vegetation in erosion control and water conservation	Jour. of Forestry. vol. 32 No. 5 May 1934.
*Still further studies on absorption of rainfall in its relations to surficial runoff and erosion	Trans. American Geophysical Union, 15th Annual Meeting 1934.
*Studies in forest influences and land use planning	SCS Mimeo.
Accelerated erosion - its effect on soil and water resources	Scientific Monthly, vol. XLI, pp. 19-28. July 1935
Certain aspects of the role of vegetation in erosion control	Reprint. Iowa State College Jour. of Sci. vol. IX, No. 3. pp. 323-407. 1935
*Civilization and soil erosion	Jour. Forestry, vol. XXXIII, No. 6 June 1935
*Man-made Deserts	Pacific Affairs, vol. VIXI, No. 4, Dec. 1935
*Man's moral obligation to the earth	Paper read at 17th Annual Meeting of Int. Assoc. of Agr. Missions March 15, 1935. No. 6, Nov. 1935
*Soil erosion and its control in the United States	USDA, SCS. Paper given in plenary session of 3rd International Cong. of Soil Sci. Nov. 1, 1935
Agricultural land use and flood control (Scientific Aspects of Flood Control)	Occasional publication of Amer. Assoc. for Advancement of Science. No. 3 Suppl. to Science, vol. 84, Oct. 1936
*Discussion	Jour. of Farm Economics, vol. XIX, No. 1. Feb. 1937
Factors influencing soil erosion	Agr. Leaders' Digest, March 1937

*Forests and soil conservation	Jour. Forestry, vol. XXXV, No. 2 Feb. 1937
Influence of vegetal cover in flood control - a panel discussion	SCS Mimeo. May 1937
*Land use and flood flows	Read at Cambridge, Ohio. Nov. 1 1937. Revised Dec. 1937
Land use patterns needed in watershed management to control erosion and stabilize streamflow	Jour. of Forestry, vol. XXXV, No. 11 (Watershed Management Symposium), Nov. 1937.
*Water intake of saturated soils	Paper given before Sec. of Hydrology, Amer. Geophysical Union, April 29, 1937
*Ethics of soil conservation	Christian rural fellowship bull. No. 31, April 1938
*Flood control in soil conservation	Paper read at the Amer. Soc. of Agr. Engin. June 29, 1938.
History of soil use in the Ku T'Ai Shan area	Monograph issued under auspices of the North China Branch of the Royal Asiatic Society, 1938 (Lowdermilk & Dean R. Wickes)
Menace of Soil Erosion	Science Digest, vol. 4, No. 6 Condensed from section of SOILS AND MEN (USDA Yearbook 1938)
*Soil conservation and public welfare	Paper read at Farm & Home Convention, Lexington, Ky. Jan. 1938
*Use of aerial mapping in soil conservation	Civil Engin. Sept. 1938.
Control of little waters in North Africa	Amer. Forests, vol. 45, No. 9, Sept. 1939.
Erosion at its worst and a hundred dead cities	Soil Conservation, Dec. 1939
Fish ponds and fields in rotation	Soil Conservation, Nov. 1939
Footprints of Roman agriculture	American Forests, vol. 45, No. 8 Aug. 1939
Strip cropping by inheritance in France	Soil Conservation, Oct. 1939

Colonization DeLuxe in Italian North Africa	American Forests, vol. 46, No. 7 July 1940
*The Eleventh Commandment	American Forests, vol. 46, No. 1 Jan. 1940
Field boundaries in rural England	Soil Conservation, May 1940
Holland builds a masterpiece of land reclamation	American Forests, vol. 46, No. 3 Feb. 1940
The lost agriculture of Transjordan	Soil Conservation, March 1940
Precedents in the control of waters	Soil Conservation, Jan. 1940
Soil erosion and flood control	Amer. Engin., vol. X, No. 2 Feb.-March 1940 and vol. X, No. 3 April-May 1940
Soil erosion and civilization	Mimeo. paper given before Dept. of Agr., Jan. 15, 1940.
Tracing land use across ancient boundaries (Letters written to H. H. Bennett re. European survey 1938-1939)	SCS Mimeo. Dec. 1940
Jewish colonization in Palestine	The Menorah Journal, vol. XXVIII No. 3, Oct.-Dec. 1940
Cedars of Lebanon - Then and now	Amer. Forests, Jan. 1941
*Written in the Syrian Desert	Amer. Forests, Aug. 1941
*Physiographic Engineering: Land erosion controls	Trans., Amer. Geophysical Union 1941
The hidden story of broken empires (Excerpts from writings)	Forest & Outdoors, Montreal, Canada vol. 37, No. 3, March 1941 pp. 68-70, 84
Soil erosion and civilization	The Womans' Press, June 1941 pp. 274-75
Soil erosion and its effect on culture	Address before Natl. Catholic Rural Life Conf. Atchison, Kans. July 1941 Mimeo.
The cedars of Lebanon	Forest & Outdoors, Montreal, Canada Oct. 1941. pp. 323-324

The scripture as written in the land.	SCS Mimeo. May 1942 (5325)
*The flag is on the plow.	Soil Conservation. vol. VII, No. 12 June 1942
Ancient irrigation in China brought up to date	Scientific Monthly, vol. LV. Sept. 1942. pp. 209-225 (Lowdermilk and D. R. Wickes)
*Lessons from the Old World to the Americas in land use	Proc., Eighth Amer. Scientific Cong. vol. 5, 1942. pp. 45-59. Reprinted, Smithsonian Report for 1943, pp. 413-428
China and America against soil erosion I. The fate of conservation in northern Shansi II. Losses and gains	Scientific Monthly, May & June 1943 vol. LVI, pp. 393-418 and 505-520. (Lowdermilk and D. R. Wickes)
China's farms fight	Soil Conservation, Dec. 1943
Living waters for the ages	American Forests, Nov. 1943 pp. 530-533, 546, 556-557.
Hwan Lung Shan, where China's history is written in the land	Soil Conservation, March 1944
Palestine, Land of Promise	Harper & Brothers, New York 1944
*Conquest of the land through seven thousand years (Illustrated lecture)	SCS Mimeo. July 1944
China's fight for fertility	Forest & Outdoors, Montreal Canada May 1944. pp. 103-104
Wasted empires (from the writings of Dr. Walter Lowdermilk)	Forest & Outdoors, Montreal Canada Aug. 1944, pp. 189-190
The hundred dead cities of Syria	Forest & Outdoors, Montreal, Canada Nov. 1944, pp. 272-73, 284
China Looks to Industrialization	China Trade News, April 1945
*Down to Earth	American Geophysical Union Trans. of 1944, Part II 25th Ann. Meeting June 1,2 & 3, 1944, Wash., D.C. pp. 195-213

China Fights Erosion With U. S. Aid	National Geographic Magazine June 1945
World-Wide Needs of Wood as a Land Conservation Crop	Proc. Amer. Philos. Soc. Symposium on Forestry & the Public Welfare, Nov. 17, 1944 (In press)

* Reprints of item marked by asterisk may be obtained from Soil Conservation Service.
Reprints of other items not available for distribution.

Erosion and Civilization	Paper read before Conference on Conservation, Human Nutrition, and Health - Athens, Ohio June 30 - July 1, 1945
Stewardship of the Earth in the Western Hemisphere	Paper delivered before Annual Convention of Municipalities of Province of Alberta - Calgary, Canada - November 23, 1945
Stewardship of the Earth in the Western Hemisphere	Paper delivered before the Calgary Board of Trade - Alberta, Canada - November 23, 1945
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Dr. Lowdermilk has been a frequent contributor to The Journal of Forestry, American Forests, Bulletins of the Soil Conservation Service, Soil Conservation, The Land, Forests and Outdoors (Canada), British and American Technion Yearbooks, and other journals specializing in soils, forest, and water resources management. The many articles published in these journals since 1945 have not been listed.

Copies of most of these publications, his speeches, and the final reports he made upon completion of his many consultations are in the Bancroft Library.

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Testimonial Dinner (to honor Dr. Lowdermilk for writing Palestine, Land of Promise), Washington, D.C., 1946.

Stephen S. Wise award for Service to Mankind, (in absentia) New York, 1953.

Medallion of Valor award, State of Israel Bonds, presented by Mrs. Eleanor Roosevelt, Los Angeles, 1961.

Man of the Year award, Israel-Los Angeles Chamber of Commerce, Los Angeles, 1961.

Maccabee award, State of Israel Bonds, Oakland, California, 1964.

Eleanor Roosevelt award, Hadassah, Sacramento, 1967.

Honorary Doctor of Technical Sciences, Technion-Israel Institute of Technology, Haifa, Israel, 1952.

Lowdermilk Department of Agricultural Engineering, officially designated title of the Department of Agricultural Engineering of Technion-Israel Institute of Technology, Haifa, Israel, 1959.

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